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ABSTRACT

This curriculum guide for students in grades K-4 is part of the My Health My World series which explores environmental health issues. Focusing on indoor environmental health, it includes (1) an activities guide for teachers which focuses on physical science, life science, and the environment and health, presenting activity based lessons that entice students to discover concepts in science, mathematics, and health through hands-on activities; (2) a colorful illustrated storybook entitled, "Mr. Slaptail's Secret," which teaches science and health concepts; (3) a reading activities booklet entitled, "The Reading Link," which presents reading activities to use with "Mr. Slaptail's Secret"; and (4) "Explorations for Children and Adults," a mini-magazine full of information, activities, and fun things to do in class or at home related to indoor air, tips for healthy living, breathing, and making a difference. (SM)

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My World Indoors:
My Health My World.

Barbara Tharp
Judith Dresden
James Denk
Nancy Moreno

Illustrated by T. Lewis

SP039607

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MY HEALTH MY WORLD
MY WORLD INDOORS

ACTIVITIES

GUIDE FOR TEACHERS

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The **My Health My World**© series for health and science education provides:

- Adventures in learning: Story Books
- Exciting hands-on: Activities Guide for Teachers
- Engaging health/science mini-magazine: Explorations for Children and Adults

The **My Health My World** series includes:

Mystery of the Muddled Marsh
Water and My World

ACTIVITIES
EXPLORATIONS
MYSTERY OF THE MUDDLED MARSH

Mr. Slaptail's Secret
My World Indoors

ACTIVITIES
EXPLORATIONS
MR. SLAPTAIL'S SECRET

WOW Publications

My Health My World®

ACTIVITIES

GUIDE FOR TEACHERS

My World Indoors

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Houston, Texas

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The activities described in this book are intended for school-age children under direct supervision of adults. The authors, Baylor College of Medicine and the publisher cannot be responsible for any accidents or injuries that may result from conduct of the activities, from not specifically following directions, or from ignoring cautions contained in the text.

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Science and Health for Kids!

These My Health My World Activities are designed to be used with other components of the My World Indoors unit:

My Health My World Adventures
Mr. Slaptail's Secret

My Health My World Explorations
My World Indoors

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About My Health My World

The My Health My World Project's exciting *Activities*, *Explorations* and *Adventures* link students, teachers and parents to significant knowledge of the environment and its relationship to human health. Prepared by teams of educators, scientists and health specialists, each My Health My World unit focuses on a different aspect of environmental health science. The activity-based, discovery-oriented approach of the My Health My World materials is aligned with the *National Science Education Standards* and the *National Health Education Standards*.

The three components of each My Health My World unit help students understand important health and environmental issues.

- *My Health My World Adventures* presents the escapades of Riff and Rosie in an illustrated storybook that also teaches science and health concepts.

  MR. SLAPTAIL'S SECRET

- *My Health My World Explorations for Children and Adults* is a colorful mini-magazine full of information, activities and fun things to do in class or at home.

  EXPLORATIONS

- *My Health My World Activities - Guide for Teachers* presents activity-based lessons that entice students to discover concepts in science, mathematics and health through hands-on activities.

  ACTIVITIES

My Health My World materials offer flexibility and versatility and are adaptable to a variety of teaching and learning styles.

Where Do I Begin?

The *Adventures, Explorations* and *Activities* components of each My Health My World unit are designed to be used together to introduce and reinforce important concepts for students. To begin a My Health My World unit, some teachers prefer to generate students' interest by reading part or all of the *Adventures* story. Others use the cover of the *Explorations* mini-magazine as a way to create student enthusiasm and introduce the unit. Still others begin with the first discovery lesson in the *My Health My World Activities - Guide for Teachers.*

If this is your first My Health My World unit, you may want to use the pacing chart on the following page as a guide to integrating the three components of the unit into your schedule. When teaching My Health My World for 45 to 60 minutes daily, most teachers will complete an entire My Health My World unit with their students in two to three weeks. If you use BrainLink every other day or once per week, one unit will take from three to nine weeks to teach, depending on the amount of time you spend on each session.

The *My Health My World Activities - Guide for Teachers* provides background information for you, the teacher, at the beginning of each activity. In addition, a listing of required materials, estimates of time needed to conduct activities, and links to other components of the unit are given as aids for planning. Questioning strategies, follow-up activities and appropriate treatments for student-generated data also are provided. Student pages are provided in English and in Spanish. The final activity in each *My Health My World Activities - Guide for Teachers* is appropriate for assessing student mastery of concepts.

Using *Cooperative Groups* in the Classroom

Cooperative learning is a systematic way for students to work together in groups of two to four. It provides an organized setting for group interaction and enables students to share ideas and to learn from one another. Through such interactions, students are more likely to take responsibility for their own learning. The use of cooperative groups provides necessary support for reluctant learners, models community settings where cooperation is necessary, and enables the teacher to conduct hands-on investigations with fewer materials.

Organization is essential for cooperative learning to occur in a hands-on science classroom. There are materials to be managed, processes to be performed, results to be recorded and clean-up procedures to be followed. When students are "doing" science, each student must have a specific role, or chaos may follow.

The Teaming Up model* provides an efficient system. Four "jobs" are delineated: Principal Investigator, Materials Manager, Reporter and Maintenance Director. Each job entails specific responsibilities. Students wear job badges that describe their duties. Tasks are rotated within each group for different activities, so that each student has an opportunity to experience all roles. Teachers even may want to make class charts to coordinate job assignments within groups.

Once a cooperative model for learning has been established in the classroom, students are able to conduct science activities in an organized and effective manner. All students are aware of their responsibilities and are able to contribute to successful group efforts.

---

* Jones, R. M. 1990. Teaming Up! LaPorte, Texas: ITGROUP.

Sample Sequence of Activities, Adventures and Explorations

The components of this My Health My World unit can be used together in many ways. If you have never used these materials before, the following outline might help you to coordinate the Activities described in this book with the unit's *Adventures* story (*Mr. Slaptail's Secret*) and *Explorations* mini-magazine (*My World Indoors*).

Similar information also is provided for you in the "Links" section of each activity in this book.

Activity	Concepts	Class Periods to Complete Activity	Links to Other Components of Unit	
			Adventures: Mr. Slaptail's Secret	**Explorations: My World Indoors**
1. Gases Matter	Air is made up of gases.	1	Read pp 1-5	Activity in yellow box (p 2)
2. About Air	Air is a mixture of gases.	1	Read pp 6-15	It's in the Air (p 4)
3. Moving Air	Warm air has more movement of molecules than cool air.	1	Read pp 16-18; make fliers in class (p 35)	Cover activity; talk about the "things in dust"
4. Breathing Machine	Air moves in and out of the lungs in response to changes in the size of the chest cavity.	1	Read pp 19-26	Breathing Machine (p 4)
5. Lungometer	People have different vital lung capacities.	2	Read pp 27-31	Riff and Rosie Talk to Dr. Cindy Jumper (p 7)
6. Heart and Lungs	The activities of the heart and lungs are linked.	2	Revisit p 17	Back cover activity
7. Dust Catchers	Dust consists of particles of different substances.	2 or more	Review yellow boxes on pp 3 and 7	Not such a new issue... (p 5)
8. Fungus Among Us	Spores from fungi are present almost everywhere.	1 or more	Revisit and discuss yellow box on p 21	Let's Talk About Indoor Air (pp 2-3)
9. There's Something in the Air	Substances in air stay concentrated in enclosed spaces.	1	Revisit the concepts presented in the yellow box on p 25	We Can Make a Difference (p 6); Tips (p 3)
10. Healthy Homes	We are able to control many aspects of indoor air that we breathe.	2	Discuss illustration on pp 28-29	Worldly Words puzzle (p 5)

Using This Unit with Students at the K-1 Level

Some modifications for younger students are appropriate. To begin the unit, introduce students to the main characters in the My Health My World Adventures storybook. Then read the beginning of the story to the students. You could follow this by demonstrating the paper-folding activity in the back of the storybook. You may want to let the students make their own, with a few helping hands, or make them for the entire group ahead of time.

Each story session should cover only about five pages of the book, accompanied by science concepts. The mini-magazine should be incorporated as appropriate. Many of the hands-on activities in this guide are more appropriately conducted for younger children as teacher demonstrations, unless you have several helpers to facilitate the activities.

Materials

You will need the following materials to teach this unit with 24 students working in six cooperative groups.

Equipment and Materials

Bracketed numbers correspond to the activities in which the item is used.

12-24	magnifying glasses [7, 8]
24	pairs plastic gloves (optional) [8]
18	8-10 oz wide-mouth plastic cups [3]
12	pairs of scissors [4, 6]
1	small, clear plastic soda bottle (10-16 oz) [1]
6	8 oz measuring cups or 8 oz plastic cups that you have marked [2]
6	aluminum soda cans [3]
6	shallow bowls [3]
6	500 ml graduated cylinders or containers that you have marked [5]
6	crayons [5]
6	large plastic tubs [5]
6	pieces of plastic tubing (¼ to 1 inch in diameter, 75 cm long) [5]
6	plastic gallon milk containers with lids [5]
6	eyedroppers [8]
6	tea candles (only one needed if a demonstration rather than activity) [3]
1	large clear plastic bag (15 gallon size or one from the cleaners) [2]
1	source of warm water [3]
1	watch or clock with a second hand or stopwatch [6, 9]
1	dusty chalk eraser or baby powder and cotton puffs [7]
1	flashlight [7]
1	knife [9]
1	meterstick or tape measure [9]
1	low-power microscope (optional) [7]

Consumable Supplies

Bracketed numbers correspond to the activities in which the item is used.

26	balloons [1, 4]
30	cups popped popcorn (see Activity 2 for description of kinds of popcorn needed) [2]
24	plastic soft drink or other small clear plastic bottles (8-24 oz) [4]
24	pieces of old bread [8]
24	sealable plastic bags (sandwich size) or small clear jars or other containers [8]
24	rubber bands [7]
15	sealable plastic bags (gallon size) [2,3]
12	8½ x 11 in sheets of construction paper (any color) [7]
8	6 m pieces of yarn or string [9]
6	8½ x 11 in sheets of blue construction paper [6]
6	8½ x 11 in sheets of red construction paper [6]
6	matches (only one needed if a demonstration rather than group activity) [3]
6	rolls of double-sided tape OR 1 jar petroleum jelly OR 1 or 2 sticks of lip balm ("Chapstick") [7]
6	sheets graph paper [7]
1	teaspoon baking soda [1]
1	container bubble solution or make your own (see page 13) [3]
1	large bowl of ice cubes [3]
1	notecard [1]
1	orange [9]
1	package "sticky" notes [5]
¼	cup vinegar [1]
1	package food coloring (blue, yellow, green) [2]

Physical Science Basics

The Air Around Us

Air is a Gas

Even though we normally can't see it or smell it, the air that surrounds us is a chemical substance. Air is a mixture of several different colorless and odorless gases (mostly nitrogen and oxygen). Like all gases, the molecules in air are distributed more or less evenly throughout any space in which they are found. When we breathe, all of the different gases in air enter and leave the lungs.

The molecules in gases, such as air, are packed much more loosely than the molecules in liquids or solids. In other words, there is a lot of empty space around the molecules of a gas. For example, oxygen gas is about 1,000 times less dense than liquid oxygen. As anyone who has inflated a tire knows, air can be compressed, so that the air inside the tire is more dense than the air outside the tire. Air also is heavy. At lower altitudes, one cubic meter of air has a mass of one kilogram.

Other gases, produced as a result of human activities, easily mix with the gases in air. Thus, the air we breathe may contain trace amounts of many different kinds of molecules.

Air Movement

At times, we are able to feel air. Air currents like wind or the air rushing out of a balloon easily can be felt. Air, like any gas, will move from an area with higher pressure and density (inside the balloon) to an area with lower pressure and density (outside the balloon). Changes in temperature also will cause movement of air and other gases. In general, warmer air will rise and cooler air will sink. Movement of air masses of different temperatures is the driving force behind air currents and winds.

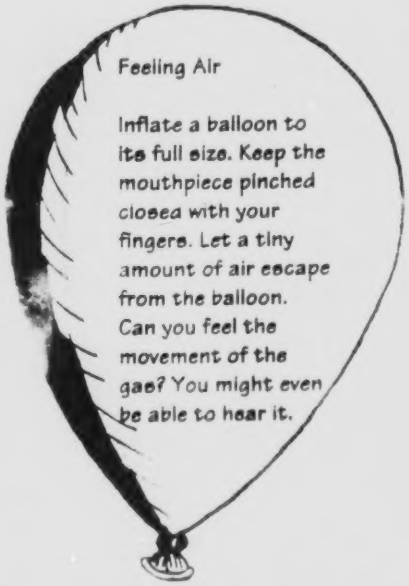
Particles in Air

The atmosphere contains various types of particles, which arise from both natural and man-made processes. The largest particles are about the size of a grain of sand (0.5 millimeters in diameter). Some particles actually are tiny droplets of liquids, like the water particles that make up fog or mist. Other particles are solids. Smoke, for example, contains very tiny solid particles that result from the incomplete burning of fuel. Living organisms also produce particles that can be found in air. Pollen grains, mold and bacterial spores, viruses and animal dander (tiny flakes of skin) all are sources of atmospheric particles.

Components of Dry Air

- Nitrogen gas (N_2) 78%
- Oxygen gas (O_2) 20%
- Argon 0.9%
- Carbon dioxide (CO_2) 0.03%
- Minute amounts of:
  Neon
  Krypton
  Helium
  Xenon
- Other substances including pollutants

Atmospheric air may contain 0.1% to 5% water vapor (H_2O) by volume.



Feeling Air

Inflate a balloon to its full size. Keep the mouthpiece pinched closed with your fingers. Let a tiny amount of air escape from the balloon. Can you feel the movement of the gas? You might even be able to hear it.

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1. Gases Matter

Background

Gases represent one of the three basic states of matter (the other two are liquids and solids). Unlike liquids or solids, gases will expand indefinitely if they are not in a container. Even though we can't see or smell many gases, it is possible to observe gases in other ways. For example, it is relatively easy to detect the pressure exerted by a gas on the walls of a balloon or an inflatable tire.

The air we breathe is a mixture of several gases. One of these is carbon dioxide, which is produced as a waste product by most living cells. Carbon dioxide also can be produced by a number of other means, including the mixing of a weak acid (vinegar) with sodium bicarbonate (baking soda).

This activity provides a basic introduction to the concept of gases. If your students already have explored gases, you may wish to use this activity as a review or begin the unit with Activity 2.

Links

This activity may be taught along with the following components of the My World Indoors unit.

Adventures:
Mr. Slaptail's Secret, pages 1 - 5
Explorations:
Activity in yellow box on page 2

Set-up

Place a clear soda bottle, a balloon, baking soda and a container of vinegar in the area you usually use for demonstrations. Conduct this activity as a discovery lesson with the entire class.

Procedure

1. In front of your students, inflate a large balloon. Ask them if there is anything inside the balloon. Stimulate a discussion about the contents of the balloon, leading them to the conclusion that the balloon contains air.
2. Point out that air consists of gases that we cannot see or smell. Mention, however, that we can tell that gases are present in the balloon because of the way in which they place pressure on the sides of the balloon and make it expand. Let the students feel the sides of the balloon.
3. Ask the students to observe as you place a few tablespoons of vinegar in the bottom of a bottle. Next, using a notecard that you have creased down the center, slide about one teaspoonful of baking soda inside a second balloon. Fasten the balloon over the mouth of the soda bottle, without letting the baking soda fall into the interior of the bottle.

CONCEPTS

- *Gases take up space.*
- *Carbon dioxide is a gas.*

OVERVIEW

A general introduction to gases for students who have not yet learned about the states of matter or a review for introductory awareness

SCIENCE & MATH SKILLS

- *Observing*
- *Drawing conclusions*

TIME

Preparation: 10 minutes
Class: 20 minutes

MATERIALS

- soda bottle
- 2 balloons
- $^1/_4$ cup vinegar
- 1 teaspoon baking soda
- notecard

When heated, most solids become liquids before they become gases. The molecules of some substances, however, move from a solid state directly to the gas phase. This process can be observed with solid carbon dioxide, also known as dry ice. In fact, the cloud of carbon dioxide gas released from dry ice at normal room temperature and pressure has been used for special effects in the theater for years.

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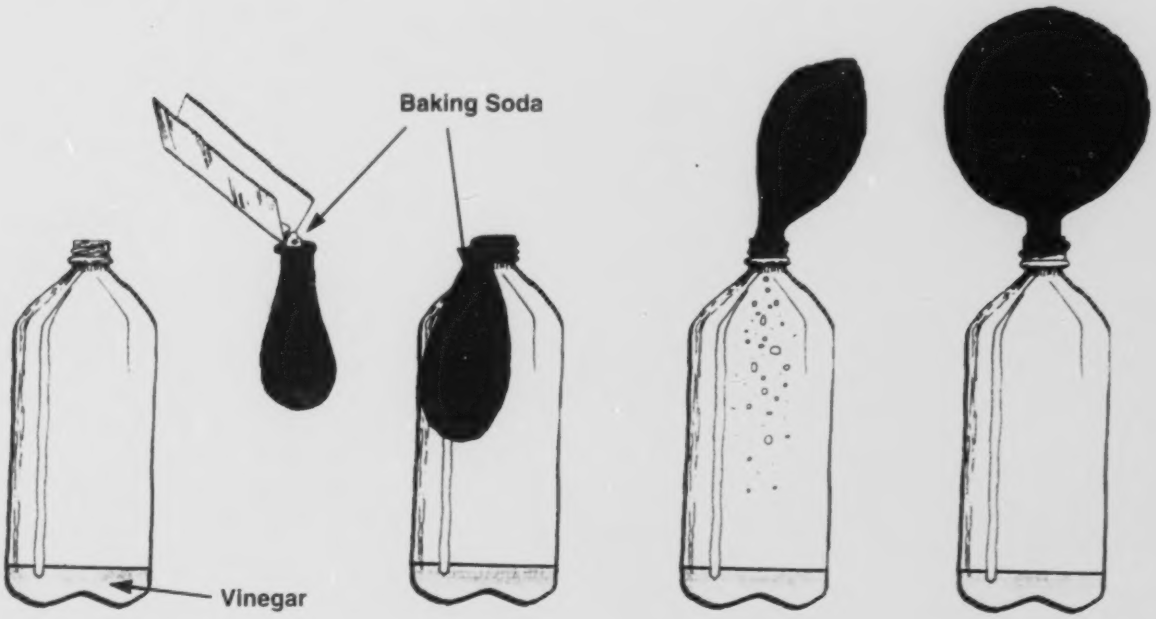
4 Gently lift the balloon upward and let the baking soda fall into the vinegar at the bottom of the bottle. As carbon dioxide is produced, the balloon gradually will inflate. Challenge the students to think about what might be causing the balloon to expand. Lead them to understand that mixing the two compounds produced a gas known as carbon dioxide. Point out that carbon dioxide is a gas that also is released from our bodies when we breathe out.



Variations

- Your students may enjoy mixing the compounds to produce carbon dioxide themselves, working in small groups. Conducted by students, this activity will take about 30 minutes to complete.
- To demonstrate how living organisms release carbon dioxide when they use food for energy to grow and reproduce, place a tablespoon of dry yeast, a teaspoon of sugar and $^1/_4$ cup of warm water in a soda bottle. Mix by gently swirling the bottle. Attach a balloon to the top of the bottle. Set the bottle aside for about 30 minutes. The balloon will begin to swell as the yeast cells become active, use the sugar for food, and release carbon dioxide.
- Have the students make the cylinder flyer described in the story, *Mr. Slaptail's Secret*. Directions for creating the flyer are given at the end of the book. Talk about what might be holding the flyers up as they soar through the air.

2. About Air

Background

About 78% of the volume of dry air is made up of nitrogen gas (N_2). Oxygen (O_2), the component of air that is required by our bodies, comprises less than one fourth of dry air. Argon, a non-reactive gas, makes up slightly less than 1% of dry air. Carbon dioxide (CO_2), a gas released from our bodies when we exhale, is present in even smaller quantities (less than one part per 1,000). Many other naturally occurring gases (such as neon, helium, methane and ammonia), as well as gases resulting from pollution, are present in air in very minute amounts. Water vapor, when present, can occupy up to 5% of the total volume of air. When we breathe, nitrogen, oxygen and all the other components of air enter and exit our lungs.

Links

This activity may be taught along with the following components of the My World Indoors unit.

Adventures:
Mr. Slaptail's Secret, pages 6 - 15
Explorations:
It's in the Air, page 4

Set-up

You will need to buy colored popcorn or tint three small batches of popcorn before you begin this activity. To tint, measure 6 cups of white popcorn into a sealable plastic bag. Add a tablespoon of yellow powdered soft drink mix and 1-3 teaspoonfuls of water. Seal the bag and shake to distribute the color. Repeat the process with green and red, using only 1 cup of popcorn each time. You should have: about 22 cups of white popcorn, 6 cups of yellow popcorn, 1 cup of yellow popcorn and 1 cup of green popcorn. Let the popcorn dry by spreading it on a paper towel or leaving the bags open.

If you are using purchased popcorn, select different flavors to represent the colors (for example, caramel popcorn for red, yellow cheese popcorn for yellow and butter-flavored popcorn for green).

The suggested amounts make about two large bowls of popcorn. If you would like to create a larger model of air, multiply the materials by two or more.

Popcorn Preparation Guide

Color	You will need about:	Students will measure:
White (= nitrogen)	22 cups	15 cups
Yellow (= oxygen)	6 cups	4 cups
Red (= argon)	1 cup	1/4 cup
Green (= carbon dioxide)	1 cup	1 kernel

CONCEPTS

- Gases occupy space.
- Air is a mixture of different gases.
- Oxygen, the gas in air needed by the body, is **not** the principal component of air.

OVERVIEW

Students will use different colors of popcorn to model the composition of air.

SCIENCE + MATH SKILLS

- Measuring
- Observing

TIME

Preparation: 10 minutes
Class: 20 minutes

MATERIALS

- Large clear plastic bag (15 gallon size or a bag from the cleaners)
- 9 sealable plastic bags (gallon size)
- 30 cups of white popcorn (already popped) and colored soft drink mix (yellow, red, green)
  OR 3 colors of purchased popcorn (see Set-Up)
- 8 oz measuring cup for each group of students
- Transparency of "Lets Measure" (page 6)

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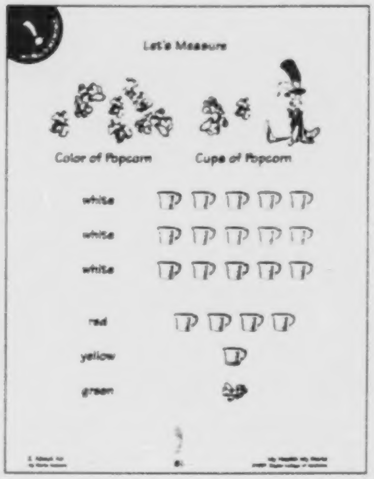
Procedure

1. Divide the students into six small groups. (If your students are very young, you may prefer to conduct the activity as a discovery lesson with the entire class.)
2. Have the materials manager from each group collect a measuring cup and a sealable plastic bag. Give each of three of the groups approximately one third of the white popcorn. Give one of the bags of colored popcorn to each of the remaining three groups.
3. Project a transparency of the Let's Measure page while you explain that the groups with white corn each will measure five cups of popcorn into their bags; the group with yellow popcorn will measure 4 cups of popcorn; the group with red popcorn will measure $^1/_4$ cup of popcorn; and the group with green popcorn will place only one kernel in its bag.
4. When the students have finished measuring, ask one student from each group to empty the popcorn from the group's sack into the large, clear plastic bag (which you will hold in a central location).
5. Shake the plastic bag. Ask, *What do you think I'm doing?* Lead the students to understand that the popcorn is being mixed. *Are the colors of popcorn arranged in a special way in the bag?*
6. Have the students identify which color of popcorn is represented by the most kernels in the bag, by the second-largest amount of kernels and so on, until you mention the single kernel of green popcorn. Follow by asking the students to name other kinds of mixtures (examples could include mixing toys in the toy box, mixing fruit salad, mixing crayons of different colors in a large container, etc.).
7. Tell the students that air also is a mixture. In this case, the mixture is made up of different kinds of gases. *Air contains many different kinds of gases. The different colors of popcorn in this bag represent different gases in air.* (Some students already will know that oxygen and carbon dioxide are involved in breathing. If they are not familiar with this information, point out that the gas we take out of air when we breathe in is known as oxygen, and that the gas we release when we breathe out is carbon dioxide.) Ask students to guess which color of popcorn represents oxygen molecules (yellow) and carbon dioxide molecules (green) in air.
8. Finally, point out that air is mostly nitrogen. The white popcorn corresponds to nitrogen molecules and the red popcorn corresponds to argon, gases that are present in air but are not absorbed by the body during breathing.

Variations

- Make your own colored and flavored popcorn using the recipe on this page.



Tasty Colored Popcorn

8 cups	popped popcorn
1/4 cup	sugar
6 tblsp	butter
3 tblsp	light corn syrup
1/4 tsp	baking soda
	food coloring

In a 2 quart saucepan, combine sugar, butter and corn syrup. Cook and stir over medium heat until mixture comes to a boil. Cook without stirring for 5 minutes. Remove from heat and stir in soda and food coloring. (If more than one color is desired, separate mixture into containers before adding food coloring). Pour mixture over popcorn and stir gently to coat. Bake in a 300° degree oven for 15 minutes, stir and bake for 10 more minutes. Remove popcorn to a large bowl to cool.

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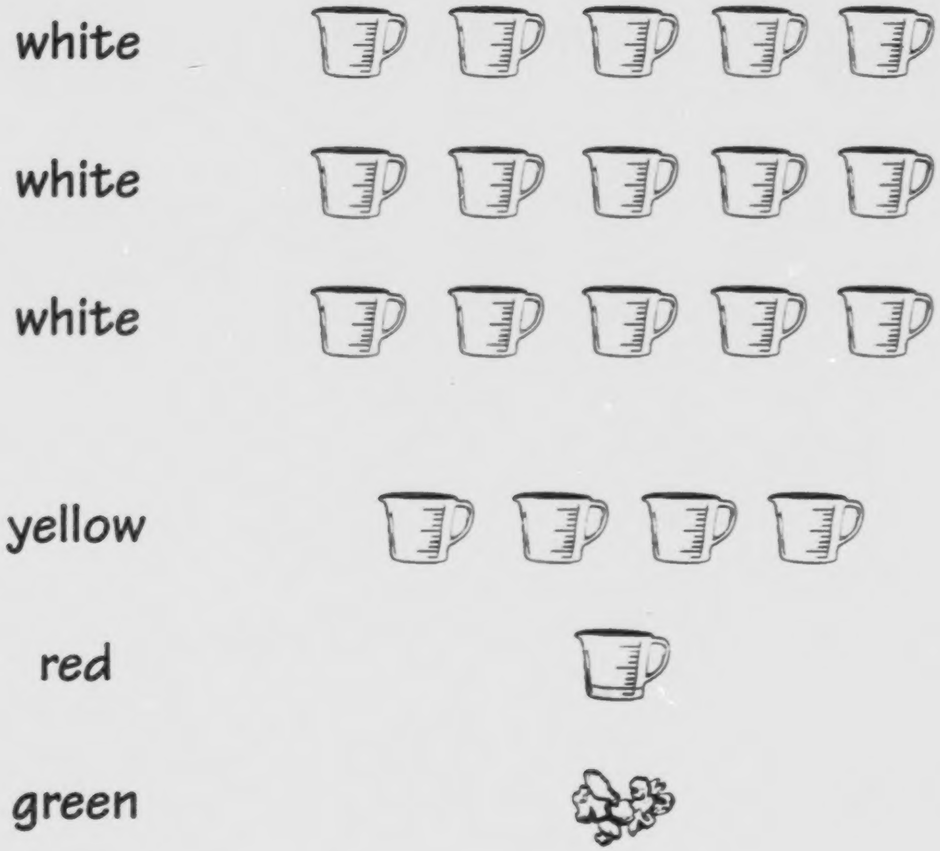
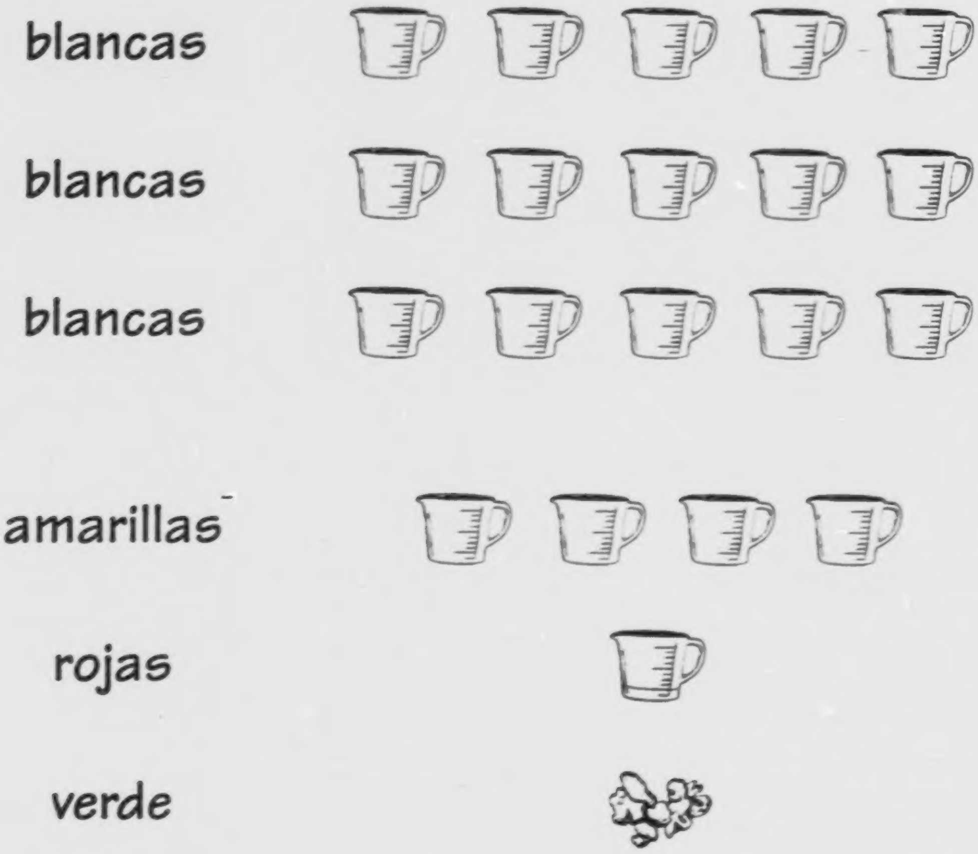
Let's Measure

Color of Popcorn Cups of Popcorn



Vamos a Medir

Color de las Palomitas Tazas de Palomitas



3. Moving Air

Background

The molecules in air (and in all gases) are constantly moving. However, the relative amounts of activity shown by gas molecules depends on temperature. At higher temperatures, molecules are more active and bounce off one another and off the sides of a container with more energy. At lower temperatures, molecules move around less and bounce with less energy. This means that a warmer gas will take up more space (because of more energetic "bouncing") than the same number of molecules at a lower temperature. These changes account for much of the air movement that we can observe both indoors and outdoors. When temperature differences are present, air currents will develop because higher-energy ("bouncier") warm air will rise and lower-energy cool air will sink.

Links

This activity may be taught along with the following components of the My World Indoors unit.

Adventures:
Mr. Slaptail's Secret, pages 16-18
Make fliers in class, just like Riff's. See page 35 of story.
Explorations:
Cover activity
Let's Talk About Indoor Air, pages 2-3

Set-up

This activity uses aluminum soda cans that you have trimmed prior to class. Cut each can approximately in half (scissors work well) and save the bottom section. You will need one can bottom per group of students (discard or recycle the top halves). Make sure that the cut edges of the cans are relatively smooth OR cover the edges with clear plastic packaging tape.

You also will need to prepare "bubble solution" if you do not have any available. To make one gallon of "bubble solution," which will keep indefinitely, mix:

1 gallon water

1 cup "Ivory" or "Dawn" dishwashing liquid

¼ cup glycerin (from the drugstore)

Have your students conduct this discovery activity in small groups.

Procedure

1. Challenge your students to predict whether there are any differences in the ways that warm air and cold air behave. Ask, *Do you think air will sink or rise if it is warmed?* Write their predictions on the board or have each group make its own prediction.

CONCEPTS

Heat causes the molecules in air to become more active and to push more against the sides of a container.

OVERVIEW

Students will observe how the warming or cooling of a small amount of air will change the amount of space that it occupies inside a bubble.

SCIENCE & MATH SKILLS

- Predicting
- Observing
- Drawing conclusions

TIME

Preparation: 30-45 minutes
Class: 30-45 minutes

MATERIALS

- aluminum soda can bottoms (1 can per group of students; see Set-Up for instructions on preparing cans)
- bubble solution (purchased, or follow recipe in Set-Up)
- shallow plastic bowls or saucers for bubble solution (1 per group)
- wide-mouthed disposable cups (8 or 9 oz. 3 per group)
- liter of ice water (or ice cubes)
- liter of warm tap water
- liter of water at room temperature
- copies of "My Observations" sheet (1 per group)
- candle and matches, hotplate, warming tray or warm towel for teacher demonstration

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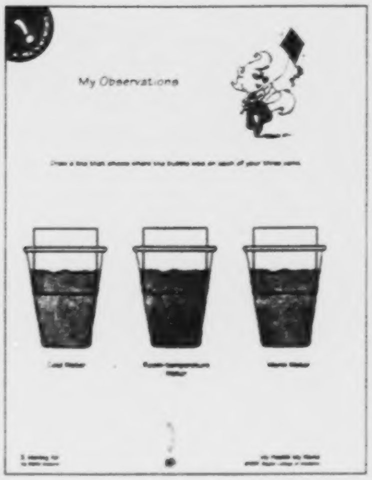
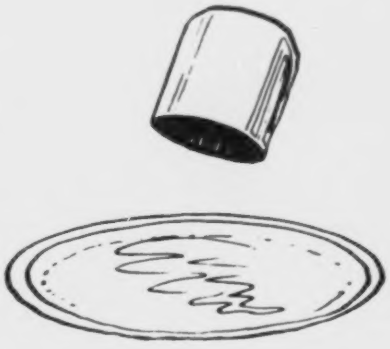
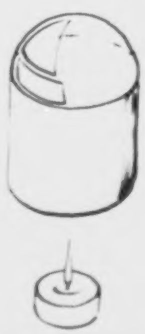
2. Set up a station where the materials manager of each group can pick up the following: 1 can bottom, 1 shallow bowl with bubble solution, 1 disposable cup half filled with warm tap water, 1 cup half filled with ice water (include a few ice cubes in each cup to keep water cold) and 1 cup half filled with room-temperature water.
3. Have students dip the open ends of their cans into bubble solution. A film of solution will be visible across the top of the can.
4. Direct the groups to place the can in one of the cups in front of them (cold water, warm water or room temperature water). Let them observe the bubble film for about a minute. Ask, *What is happening to the bubble? What does this tell us about the air inside the can?*
5. Have the students record their observations on the My Observations sheet. Then have them place their can in one of the other cups and observe the bubble film. Let them record their results before placing and observing the can in the third cup. Students should re-dip their cans to make new bubble films each time.
6. Discuss the predictions that they made about the behavior of warm and cool air in light of the observed behavior of the gases in the cans. Ask, *What do you think will happen if we heat the air in the can even more?* In a demonstration area, dip another can in bubble solution; then heat it using a lighted candle, hotplate, heating tray, warm towel, etc. (The bubble will bulge much more dramatically.)
7. Discuss the students' discoveries about air movement and ask them to think about what might be happening with the air inside the classroom. Ask, *What happened to the air inside the can when it was placed in cold water? In warm water?* Follow by encouraging a general discussion: *Where are the sources of different temperatures of air in the room? What will happen if some of the air in the room is warmer than air in other parts of the room?*




Have students dip their cans in bubble solution.

Variations

Let your students use bubbles to study air movements in other ways. For example, have them gently blow bubbles up into the air. Ask them to observe where the bubbles travel. Do they eventually fill the room? Do they move upward or downward? (An inexpensive bubble blower can be made from a paper cup by removing the bottom.)

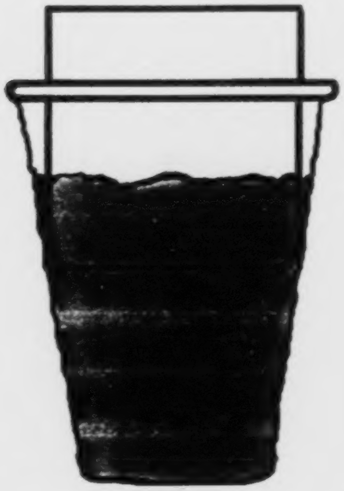

Dip a can in bubble solution, then hold it over a heat source.

Questions to Think About

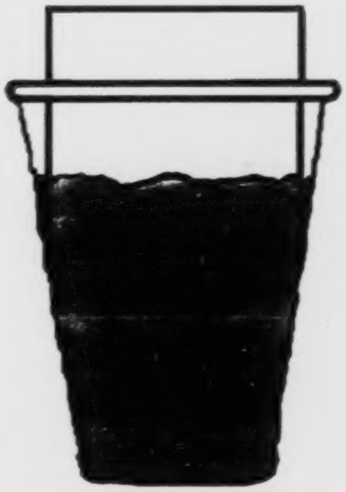
- Given that temperature differences cause air movement, predict how this will affect the distribution of dust and other pollutants within a room or building. (Also see Activity 9)
- Consider the earth by looking at a map or globe. The sun heats air near the equator much more than it heats air near the poles (the poles are farther away from the sun). How do you think these temperature differences affect air movement on the planet? Compare your predictions to wind patterns shown on a weather chart.

My Observations

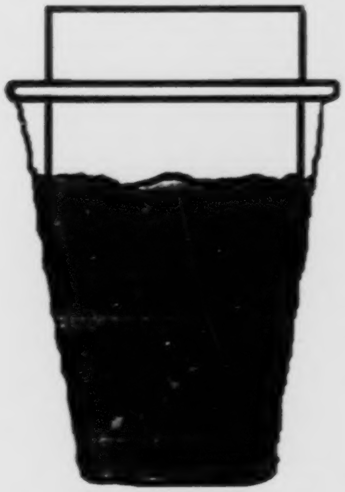
Draw a line that shows where the bubble was on each of your three cans.



Cold Water



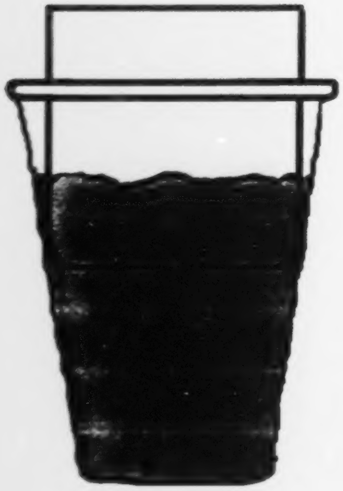
Room-temperature Water



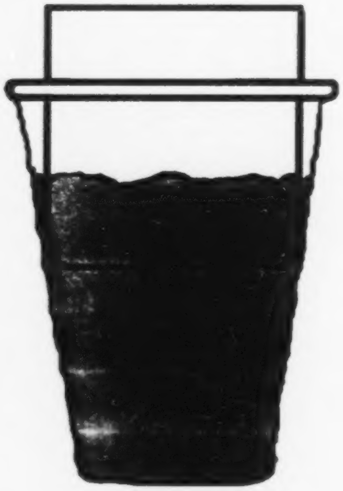
Warm Water

Mis Observaciones

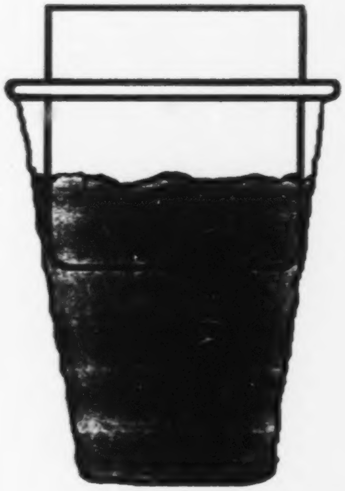
Dibuja una línea que señala donde quedó la burbuja en cada uno de los envases.



Agua Fría



Agua con la Temperatura del Ambiente



Agua Tibia

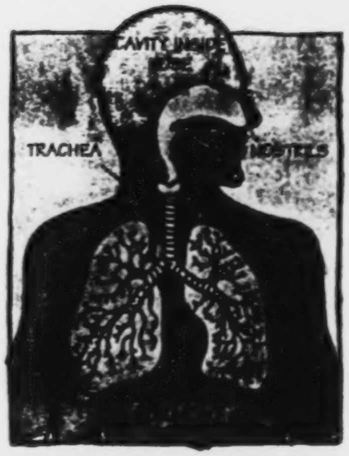
Biology Basics

Breathing

Respiration

The cells in our bodies require oxygen to complete the reactions that allow energy to be released from sugars and other compounds. This process, known as aerobic (from *aeros* = air) respiration, produces carbon dioxide as a waste product.

Many different systems have evolved to supply cells within large organisms with oxygen and provide a way to eliminate carbon dioxide. Fish, for example, have gills, which draw water across thin membranes and allow dissolved oxygen to be transferred into the bloodstream. Insects have a network of small tubes that branch throughout the body and carry air directly to individual cells. Most other land animals use lungs and a blood transport system to take in oxygen and send it to all parts of their bodies, while removing carbon dioxide at the same time.



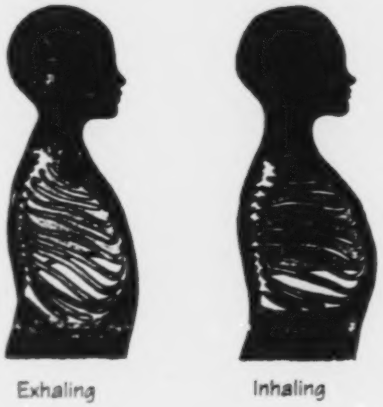
Air enters the body through the nose. It reaches the lungs, where oxygen is taken out and carbon dioxide, a waste product, is released.

The Breathing System

The human respiratory system is similar to that of all other mammals. Air enters the nose, where it is warmed and filtered. It passes through the region at the back of the throat (pharynx) and enters the larynx (also called the Adam's apple), or voice box. From there it passes through the trachea into the chest cavity. The trachea branches into two tubes (plural bronchi; singular bronchus), each leading to one of the lungs. Each bronchus branches and rebranches, forming smaller and smaller ducts. These terminate in tiny pockets, called alveoli, which are surrounded by minute blood vessels. Within the alveoli, oxygen moves into the blood stream and carbon dioxide diffuses out.

How We Breathe

Breathing, the actual process of drawing in and expelling air, is a partially passive process controlled by changes in the volume of the chest cavity. The work of breathing is accomplished by the muscles of the walls of the chest and the diaphragm, a thin layer of muscles at the base of the chest cavity. When these muscles tighten, they increase the size of the space inside the chest. This causes air to rush into the lungs. When the muscles relax, the space becomes smaller and air moves out of the lungs.



Breathing is controlled by changes in the size of the chest cavity.

When we breathe, all components of air (including pollutants) are drawn into the lungs. Some harmful substances can be expelled from the body by coughing or sneezing. Others are trapped and eliminated in mucus. A few, however, remain in the lungs, where they can cause permanent irritation or damage. Some chemicals in air even are absorbed into the bloodstream through the lungs and are transported to other parts of the body.

4. Breathing Machine

Background

Each of us breathes about eight to ten times per minute. When we exercise, the rate increases to 15 or 20 times per minute. Surprisingly, our lungs have no muscles of their own. How, then, is the work of breathing done?

The diaphragm and rib muscles of the chest wall work for the lungs. By changing the size of the chest cavity, these muscles control whether air enters or exits the lungs.

The diaphragm is responsible for about 75% of the air flow in breathing. It is a broad, thin muscle that stretches across the body between the chest and the abdomen. At rest, the diaphragm actually bulges upward. When we are about to take a breath of air or inhale, the diaphragm moves downward and, in the process, increases the space available (and decreases total pressure) within the chest. The rib muscles move upward and outward at the same time and increase the space available for air flow by another 25%. Outside air rushes in to fill this space. Normal breathing out, or exhalation, is largely a passive process. As the muscles of the chest and diaphragm relax, the space inside the chest becomes smaller and air moves out of the lungs. When we exhale forcibly, some of these muscles actively help push the air out.

Links

This activity may be taught along with the following components of the My World Indoors unit.

Adventures:
Mr. Slaptail's Secret, pages 19 - 26
Explorations:
It's in the Air (poem on page 4)
Directions for making Breathing Machines also are given on page 4 of the Explorations.

Set-up

One or more days before you begin this activity, ask each student or group of students to bring a medium-sized clear plastic bottle (such as from a soft drink, mineral water, pancake syrup or liquid dishwashing detergent) from home. You will need to cut off and discard the bottom third to one-half of each bottle. The remaining top part of the bottle should be about 6 inches (15 cm) tall. (Note: liter size soda bottles are too large to work effectively in this activity.) If the cut edges are sharp or jagged, cover them with clear plastic packaging tape.

This investigation works best with groups of two to four students. They may make one Breathing Machine per group or assist each other as they each make their own.

CONCEPTS

Air moves in and out of the lungs in response to volume changes in the chest cavity.

OVERVIEW

Students will create a working model of the lungs, chest and diaphragm.

SCIENCE & MATH SKILLS

- Predicting
- Observing
- Modeling
- Drawing conclusions

TIME

Preparation: 20 minutes
Class: 30-45 minutes

MATERIALS

- small clear plastic bottles - such as from soft drinks, dishwashing detergent, etc. (1 per group or per student)
- 9 inch balloons (2 per group or per student)
- scissors (1 pair per group)

Did you know that the speed of a cough can reach 340 miles per hour?

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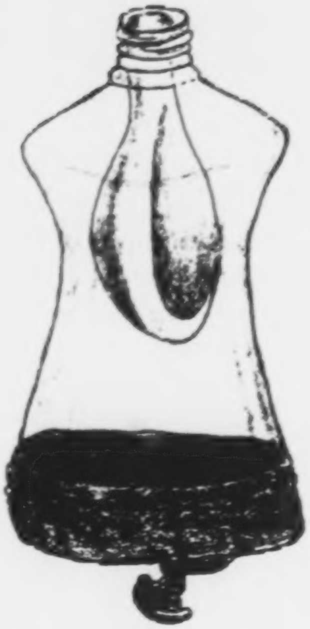
Procedure

1. Begin by asking each student to notice his or her own breathing. *How many times are you breathing per minute? How can you tell? Which parts of your body move when you breathe? Let's investigate how the lungs work by making a model.*
2. Have the materials managers pick up plastic bottles (bottom halves already removed) and balloons for their groups.
3. Direct the students to slide a balloon into the mouth of each bottle and roll the open end over the top edge of the bottle. This will be the "lung" in the model.
4. Another student should cut off the top of the second balloon and tie a knot in the stem end of the remaining piece. While one student holds the bottle, another should slide the cut end of the balloon around the bottom of the bottle.
5. Now, have one student in each group pull the bottom balloon carefully downward. Ask, *What happens to the "lung" balloon?* Point out that this is similar to what happens when each of us breathes in. Next, direct the students to squeeze gently the sides of the bottle and push the bottom balloon into the space in the bottle. *Now what happens?*



The "breathing machine" shows students how changes in volume affect air flow into or out of the lungs.

Variations

- Before beginning this activity, have students make predictions about how air might be drawn into and out of the lungs.
- Challenge your students to make their lung models cough or sneeze. For a more dramatic effect, place $^1/_2$ teaspoon baking soda or baby powder inside the balloon "lung" and make the lung model cough or sneeze.
- The breathing machine also is described in the My Health My World Explorations mini-magazine, *My World Indoors*. You may prefer to have students make their breathing machines at home with an older family member or friend.

Questions to Think About

When we breathe in, oxygen is removed from the air in our lungs and carbon dioxide is released. What happens to the other things in air when we breathe in? Do we breathe nitrogen and other gases in and out? What about harmful things in air? Do we also breathe them in?

If you spread out all the tiny pockets in the lungs, they would cover an area the size of a tennis court.

In addition to a pair of lungs, birds have several thin-walled air sacs within the body cavity. The air sacs are part of a very efficient breathing system that allows birds to fly actively at high altitudes.

5. Lungometer

Background

When we breathe inward (inhale), air from outside enters our airways and lungs. As was shown in the previous activity, breathing is a mechanical process, driven by changes in the volume of the chest cavity. The air that is taken in during a normal breath represents only part of the total amount of air that can be held by the lungs. Likewise, the amount that is normally breathed outward (exhaled) represents just a portion of the total amount of air that can be expelled.

The maximum amount of air that can be blown out of the lungs after taking a deep breath is known as vital lung capacity. Some air, however, always remains in the lungs and airways.

Diseases of the lungs and airways affect lung volumes and capacities in many different ways. Some diseases reduce the vital capacity of the lungs. Others cause changes in the amounts of air that are held in the lungs after air is blown out forcefully.

Links

This activity may be taught along with the following components of the My World Indoors unit.

Adventures:
Mr. Slaptail's Secret, pages 27-31
Explorations:
Riff and Rosie Talk to Dr. Cindy Jumper, page 7

Set-up

This activity requires two class periods and is appropriate for students to carry out in small groups. Students should rotate jobs, so that each student will have an opportunity to measure his or her vital lung capacity. As an alternative, you can present the lungometer as a demonstration or let each student measure his/her vital lung capacity on a lungometer that you have made.

Most students will find it helpful to see a "lungometer" that you have constructed (see steps 1-10) before they attempt to make one themselves.

Procedure

Lungometer (30-45 minutes)

1. Make a Lungometer (see instructions on Make a Lungometer sheet) and demonstrate your vital lung capacity to the class. Tell the students that they will be able to measure their own vital lung capacities using lungometers that they will build. If they have read *Mr. Slaptail's Secret*, mention that they will be making a lungometer just like the one that Riff built.

CONCEPTS

- Air takes up space.
- The lungs hold air.
- Air travels in and out of the lungs.
- People differ in the amount of air that they can blow out of their lungs.

OVERVIEW

Students will investigate their own vital lung capacities - the amount of air that can be forced out of the lungs in a single breath.

SCIENCE & MATH SKILLS

- Predicting
- Observing
- Measuring
- Graphing

TIME

Preparation: 10-20 minutes
Class: one session of 30-45 minutes to build and use lungometers; one session of 30-45 minutes to examine results

MATERIALS

- plastic gallon containers with lids (1 per group)
- plastic tubes (1 per group)
- rubber or plastic tubing - 0.5-2 cm in diameter (1 piece, 75 cm long, per group or per student)
- 500 ml graduated cylinders or containers that you have marked
- crayons (dark colors)
- water
- copies of "Make a Lungometer"
- copies of "Lungometer Data Sheet"

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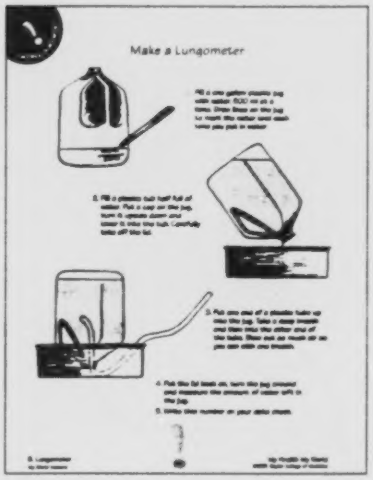
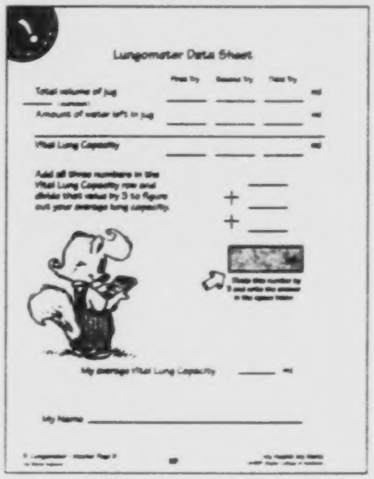


Make a Lungometer

2. Have the materials manager from each group pick up a clean plastic gallon milk container and lid, a plastic tub, one or more pieces of plastic tubing and a crayon from a central area.
3. Fill the tub (or have the students fill the tubs) belonging to each group about half way with water.
4. Have the students in each group calibrate the volume of their plastic jug by adding water, 500 ml at a time. One student should pour and another should label each level (500 ml, 1,000 ml, 1,500 ml, etc.) using a crayon. When the jug is filled, **put on the lid.**
5. Let two students from each group turn the milk jug upside down and lower it into the tub of water, submerging the top.
6. While **two students continue to hold the jug in the water,** a third student should carefully remove the lid and place one end of the tubing up into the mouth of the jug. The lungometer is now ready for testing.



Lungometer Data Sheet

Total volume of jug

Amount of water left in jug

Vital Lung Capacity

My Name

7. To measure vital lung capacity, a student will breathe in deeply and then blow out all the air that he or she can through the tubing into the jug. Afterward, the students holding the jug **should put the lid back on** and carefully turn it upright. This will enable them to determine the amount of water remaining. Have each student record this value on his/her Lungometer Data Sheet.

   NOTE: Wash the tip of the tubing with antibacterial soap and water or soak it in a solution of water with a few tablespoons of chlorine bleach before the next student tries the lungometer. OR provide a separate piece of tubing for each student. Wash tubing before storing or using again. OR insert a small piece cut from a plastic drinking straw in the tubing as a mouthpiece.
8. Have younger students measure their vital lung capacities once. Older students may try three times and find an average.
9. Give students an opportunity to calculate their vital lung capacites as shown on the Lungometer Data Sheet. (Total volume of jug will equal approximately 4,000 ml with a standard gallon milk jug.)

Looking at Results (30-45 minutes)

1. With younger students, draw a large graph on the board. Label the X axis "Students." Number the Y axis from 0 to 4,000 ml at 500 ml intervals. Have the students write their names and lung capacity measurements on "sticky" notes. Help each student to place his/her "sticky" at the appropriate level on the graph.
2. Older students should obtain the average value for their vital lung capacities as shown on the Lungometer Data Sheet. After they have completed their calculations, have students graph their average vital lung capacities as described above.

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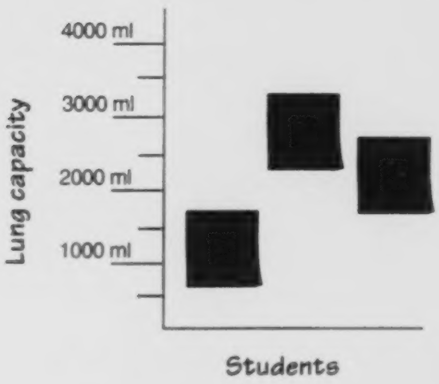
Class Graph of Vital Lung Capacities



3. Discuss the class results represented on the graph. *Which was the highest vital lung capacity? Which was the lowest? What is the range of values that we found? How could we find the average vital lung capacity for the class?*
4. Elicit a discussion of factors that might limit vital lung capacity. Ask questions such as, *What might account for differences in vital lung capacity? Do large people have larger vital lung capacities? How does exercise affect vital lung capacity? How might smokers' vital lung capacities compare to those of non-smokers?*

The *Explorations* component of this unit features a doctor specializing in lung diseases (page 7). She is pictured with a real "lungometer," known as a *spirometer*.

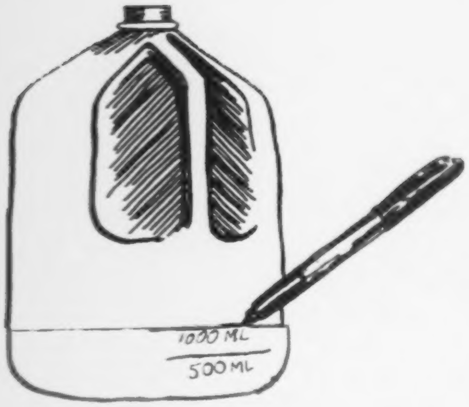
Variations

Have students group their data (for example, by student height or by amounts of daily exercise) to look at some of the questions raised during their classroom discussion.

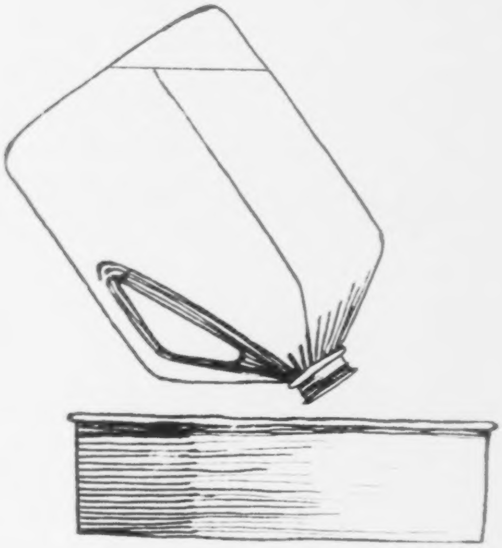
Questions to Think About

- Which types of diseases might limit a person's ability to blow out much air? Use resources in your classroom or library to investigate diseases of the airways and lungs. (Examples include asthma, emphysema, some types of bronchitis, and occupational lung diseases caused by prolonged exposure to asbestos or certain kinds of dusts.)
- In the story, *Mr. Slaptail's Secret*, Mr. Slaptail improves his ability to blow air out of a lungometer like the one constructed in this activity. What changes did he make in his lifestyle that led to this improvement?

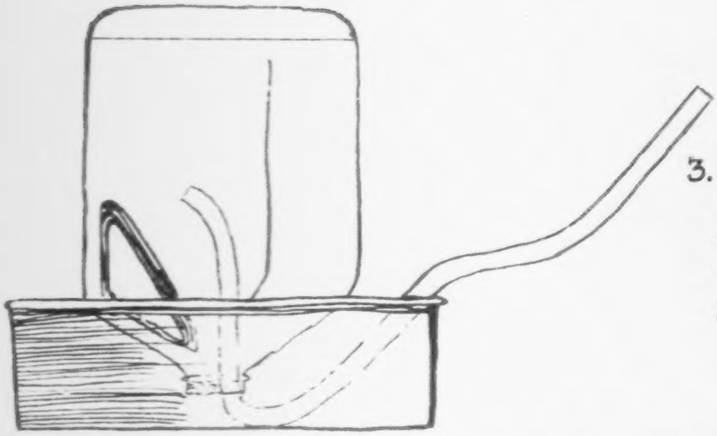
Make a Lungometer



1. Fill a one gallon plastic jug with water, 500 ml at a time. Draw lines on the jug to mark the water level each time you put in water.

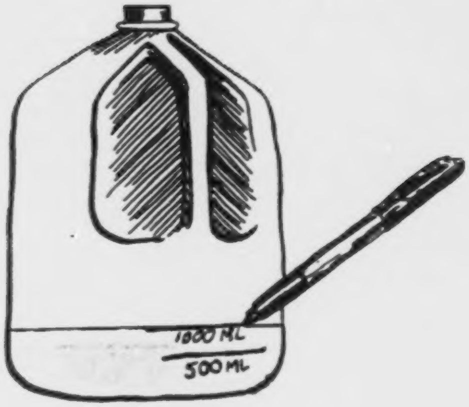


2. Fill a plastic tub half way with water. Put a cap on the jug, turn it upside down and lower it into the tub. Carefully take off the lid.



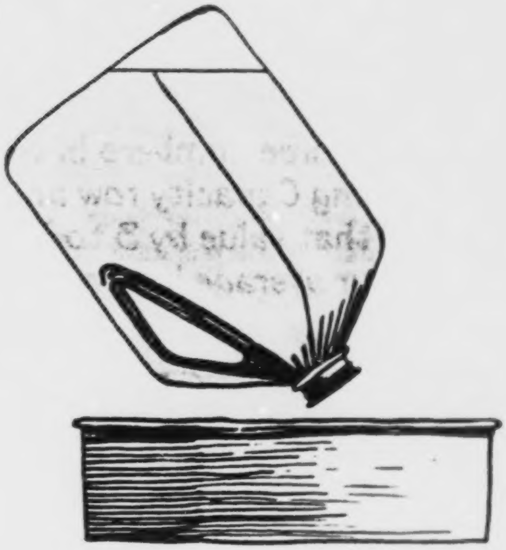
3. Put one end of a plastic tube up into the jug. Take a deep breath and blow into the other end of the tube. Blow out as much air as you can with one breath.
4. Put the lid back on, turn the jug around and measure the amount of water left in the jug.
5. Write this number on your data sheet.

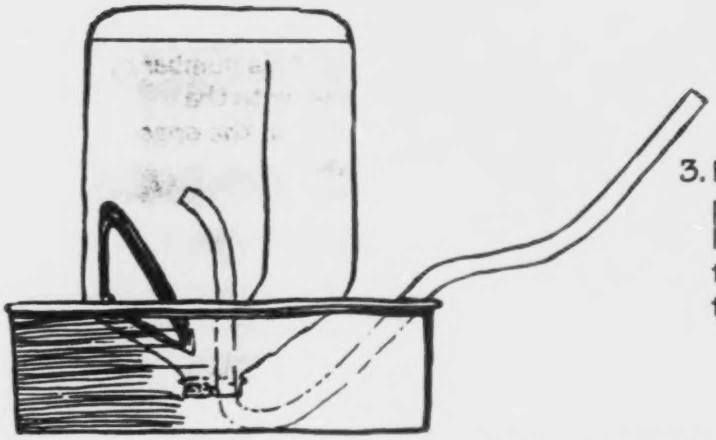
Haz un Pulmómetro



1. Llena una botella de plástico de un galón con agua usando una medida de 500 ml. Marca el nivel cada vez que añades 500 ml de agua.

2. Llena una tina hasta la mitad con agua. Tapa la botella con cuidado y viértela en la tina de agua. Quita la tapadera de la botella.





3. Pon la punta de un tubo de plástico dentro de la botella. Inhala profundamente y sopla todo el aire que puedas por el tubo sin respirar otra vez.

4. Tapa la botella y girala nuevamente. Mide la cantidad de agua que quedó en la botella.

5. Escribe este número en tu hoja de datos.

Lungometer Data Sheet

	First Try	Second Try	Third Try	
Total volume of jug	______	______	______	ml
Amount of water left in jug	– ______	– ______	– ______	ml
Vital Lung Capacity	______	______	______	ml

Add all three numbers in the Vital Lung Capacity row and divide that value by 3 to figure out your average lung capacity.

______
+ ______
+ ______

☐ ml

Divide this number by 3 and write the answer in the space below

My average Vital Lung Capacity ______ ml

My Name ______________________________

Hoja de Datos para el Pulmómetro

	Primer Intento	Segundo Intento	Tercer Intento	
Volumen total de la botella	______	______	______	ml
Cantidad de agua que quedó en la botella	– ______	– ______	– ______	ml
Capacidad Vital Pulmonar	______	______	______	ml

Suma todos los valores que obtuviste para Capacidad Vital Pulmonar y divide la respuesta por tres para calcular tu capacidad promedia.

______
+ ______
+ ______

☐ ml

Divide este número por tres y escribe la respuesta en el espacio abajo.

Mi Capacidad Vital Pulmonar promedio ______ ml

Mi nombre ____________________________________

6. Heart and Lungs

Background

The heart and lungs work together to supply all the tissues in the body with oxygen, as well as other materials, and to carry away waste products, such as carbon dioxide. All the cells in our bodies need oxygen to carry out the reactions that release energy. Carbon dioxide is a waste product of this process and is produced inside cells when energy is released from sugars and other molecules.

Usually when parts of the body need more oxygen (as might be the case during exercise), the lungs and heart respond by increasing the rate at which they work. The lungs also take in more air, so that more oxygen can be absorbed into the blood stream and transported to the tissues that are working.

Heart rate often is measured by feeling the surge of blood that occurs after each heart beat at places where arteries are near the surface of the skin (wrist, for example). This recurrent surge is known as the pulse. When the number of pulses per minute is measured, it usually is referred to as pulse rate (heart beats per minute). The average pulse rate for a child ranges between 60 and 120 beats per minute.

Links

This activity may be taught along with the following components of the My World Indoors unit.

Adventures:
Mr. Slaptail's Secret, revisit science box on page 17
Explorations:
- Where Does the Air Go When You Breathe? (back cover)

Set-up

This investigation works best when the class is divided into two-person teams. The members of each team should take turns monitoring each other. Conduct this activity with the entire class if you teach young students who are not able to tell time.

Procedure

Making the Cut-Outs (10-15 minutes)

1. Give each student 1/4 page of red and 1/4 page of blue construction paper. Direct each child to cut out a red and a blue heart, and a red and a blue set of lungs. Use the pattern given on the Heart and Lungs Cut-Outs page. (This can be integrated into a mathematics or art lesson as a symmetry activity.) Have them write their names on their cut-outs.

CONCEPTS

- The functions of the heart and lungs are linked.
- The heart and circulatory system work with the lungs to supply the body with oxygen and to eliminate carbon dioxide.
- The rates at which the heart and lungs work depend on levels of activity.

OVERVIEW

Students will investigate their breathing and pulse rates and how these are affected by physical activity.

SCIENCE & MATH SKILLS

- Observing
- Measuring
- Comparing data
- Drawing conclusions

TIME

Preparation: 10 minutes
Class: 30-45 minutes to make cut-outs and measurements; 30 minutes to graph and summarize results

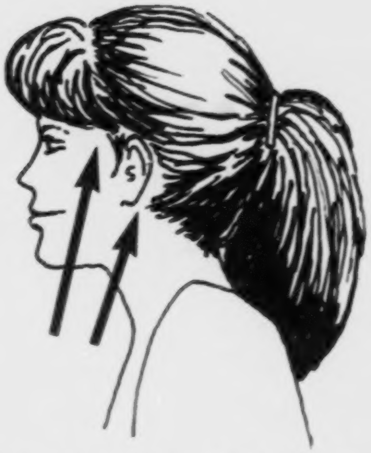
MATERIALS

- watch or clock with a second hand, or stopwatch
- blue and red construction paper (1/4 page of each color for each student)
- scissors
- copies of "Heart and Lung Cut-Outs" (one per student) and "Heart and Lungs Data Sheet" (one per student)

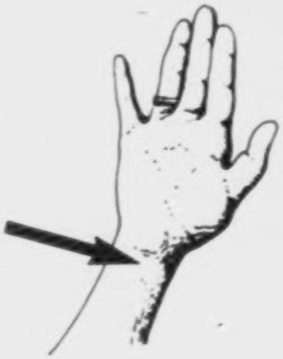
Gathering Data (30-40 minutes)

1. Explain to students that they will be investigating their breathing and heart rates. Make sure they understand that a "rate" is a measure of "how fast" or "how slow" something is happening.
2. Group the students in pairs. Ask them to sit quietly and breathe normally. Have one student count the number of times his/her partner inhales (breathes in) in one minute, and record the results on a copy of the Heart and Lungs Data sheet. Older students can time themselves, using a watch or stopwatch. You will need to time younger students. If students have difficulty observing the breathing of their partners, instruct the students being observed to raise their hands each time they inhale.

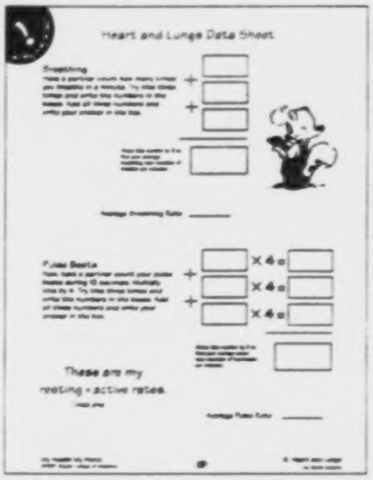
   Have older students repeat the measurements at least three times to calculate an average. Then let the students switch jobs. With younger students, conduct this procedure as a whole class activity. You can direct the timing, while students take turns counting and recording their partners' breathing rates.
3. Prepare the students to measure their pulse rates (heart beats per minute) by demonstrating ways to locate a pulse point. Those easiest to locate include: the top portion of the inner wrist, the carotid artery on the left side of the neck (just under the jaw and ear), and the temple. Give students some time to locate their pulse points and practice counting beats.
4. Instruct the students to count their heart beats by feeling the tiny surge at their pulse points, while they are timed for 15 seconds by their partners. For older students this value should enter on their worksheets and multiply by four to obtain the number of beats per minute. Younger students may add this value four times to find beats per minute. Older students should take the reading three times. Have the students switch jobs and repeat the process. Again, with younger students, you probably will want to direct the activity and measure the time.
5. Next, tell the students that they are going to investigate their breathing and pulse (or heart) rates after physical activity. Have one member of each team run in place for one minute and sit down. Have their partners count the number of times they inhale in one minute. Let older students repeat this procedure three times and obtain an average. Then, let the students switch jobs and repeat the process. This should be teacher-directed for younger students.
6. To investigate pulse rate after activity, have the students repeat the process described in steps 3 and 4 after running in place for one minute.



Pulse points on the temple and behind the ear



Pulse point on the wrist.



Heart and Lungs Data Sheet

× 4 =

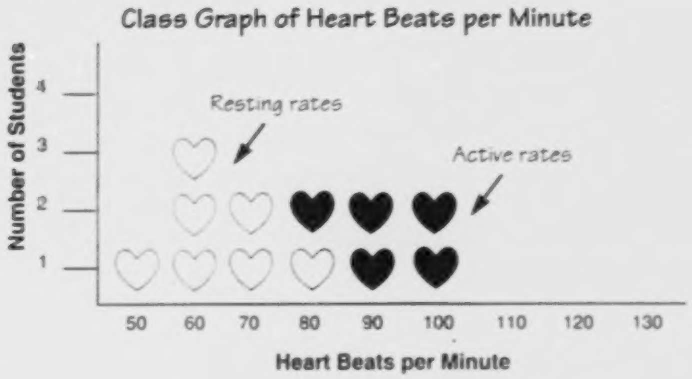
× 4 =

× 4 =

These are my resting • active rates.

Graphing (30 minutes)

1. Draw two large grids for class graphs—one for Heart Beats Per Minute and another for Breaths Per Minute. This can be done on chart paper or on the board. Lines on the vertical axis should be 6 cm apart. Lines on the horizontal axis should be approximately 12 cm apart. Make sure that students understand that they were able to quantify their heart rates by counting the tiny surges of blood moving through an artery after each heart beat.


Class Graph of Heart Beats per Minute

2. Using blue for resting rate and red for active rate, have students write their names and rates on the appropriate cut-outs. Tape the students' cut-outs on the appropriate class graphs OR help each student position his or her cut-outs on the graphs.
3. Ask, *Where are most of the blue hearts on the graph? How about the red hearts? Where are the blue lungs? The red lungs? How does exercise affect a person's breathing rate? Heart rate?*

Variations

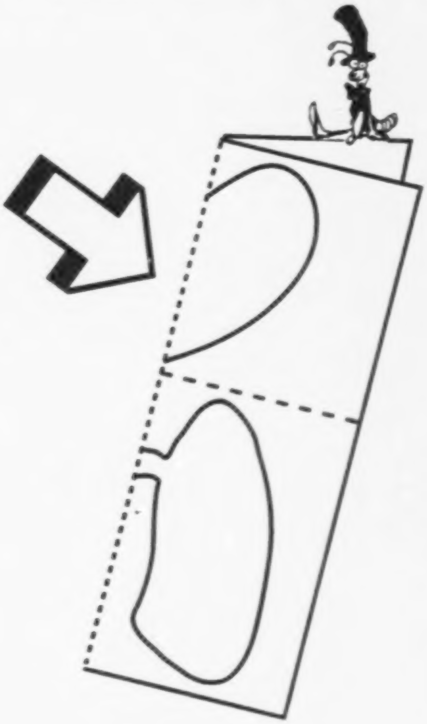
Investigate heart and breathing rates with more exercise or upon waking.

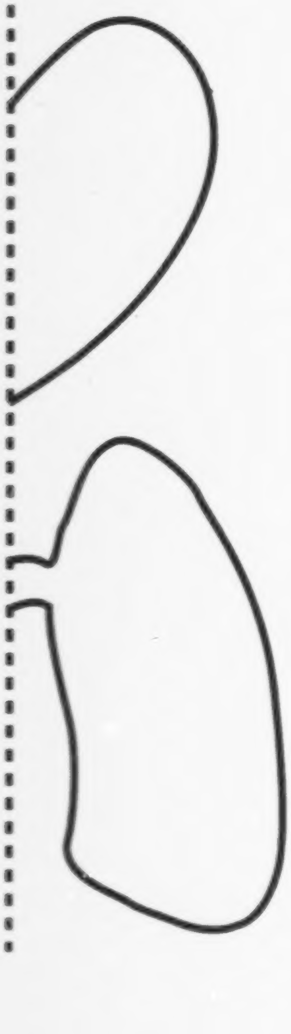
Questions to Think About

- Do you predict that trained athletes have higher or lower breathing and pulse rates than students at rest? During activity? How could this be investigated?
- How do your "rates" compare to those of your parents?
- How might activities like smoking affect heart and breathing rates during exercise?
- What do you think might have happened to Mr. Slaptail's breathing and pulse rates after he stopped smoking?

Heart and Lung Cut-Outs

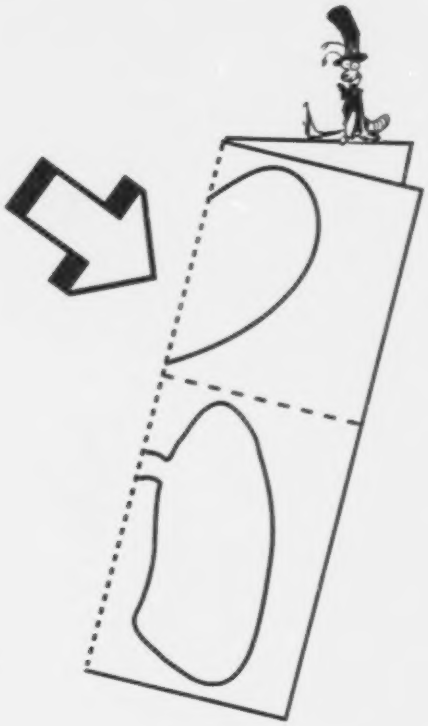
Cut out the two shapes below. Fold your red and blue sheets of paper in half the long way. Lay the shapes on your blue paper as shown. Cut along the lines and open your heart and lung figures. Lay the shapes on your red sheet and cut out the figures in the same way.

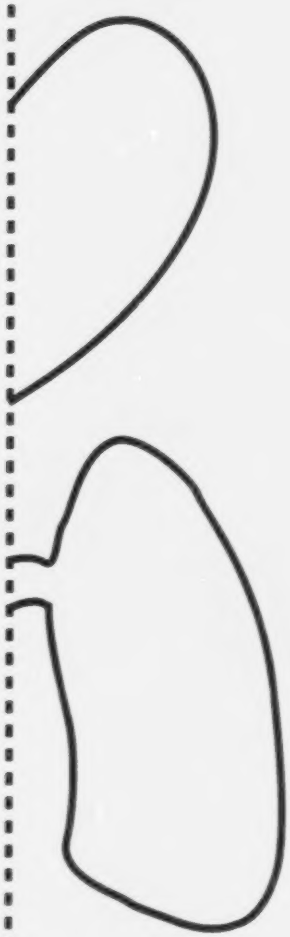




Figuras de Corazón y Pulmones

Recorta las dos figuras que están abajo. Dobla tus papeles (uno rojo y uno azul) a lo largo. Pon las figuras encima del papel azul. Recórtalas y abre tus figuras de corazón y pulmones. Ahora, pon las figuras encima del papel rojo y recórtalas también.





Heart and Lungs Data Sheet

Breathing

Have a partner count how many times you breathe in a minute. Try this three times and write the numbers in the boxes. Add all three numbers and write your answer in the box.

☐
+ ☐
+ ☐

Divide this number by 3 to find your average breathing rate (number of breaths per minute). ☐

Average Breathing Rate ____________

Pulse Beats

Now, have a partner count your pulse beats during 15 seconds. Multiply this by 4. Try this three times and write the numbers in the boxes. Add all three numbers and write your answer in the box.

☐ × 4 = ☐
+ ☐ × 4 = ☐
+ ☐ × 4 = ☐

Divide this number by 3 to find your average pulse rate (number of hearbeats per minute). ☐

These are my

resting • active rates.

Circle one

Average Pulse Rate __________

Hoja de Datos-Corazon y Pulmones

Respiración

Pide a tu compañero que cuente las veces que respires en un minuto. Hazlo tres veces y escribe los valores aquí.

+

+

Divide este numero por tres para obtener un promedio de tu tasa de respiración (veces por minuto).

Tasa Promedio de Respiración __________

Pulso

Ahora, pide a tu compañero que mida 15 segundos mientras te tomas el pulso. Hazlo tres veces y escribe los valores aquí.

× 4 =

+ × 4 =

+ × 4 =

Divide este numero por 3 para obtener un promedio de tu tasa cardiaca (latidos por minuto).

Estos son mis resultados cuando estoy descansando • activo

marca uno

Tasa Cardiaca Promedio __________

Environmental Health Basics
Indoor Air Pollution

Indoor Air

The "environments" in which we spend most of our time are our homes, schools and offices. While we often think that most air pollutants are concentrated out-of-doors, in many cases, levels of several kinds of contaminants are higher indoors. Energy-efficient designs can lead to the concentration of certain substances in the air inside buildings. The Environmental Protection Agency estimates that 30% of all buildings and homes in the United States contain enough pollutants to affect people's health. Indoor air pollutants can be responsible for allergic reactions, infectious diseases, chronic irritation of parts of the airways, and toxic reactions (including damage to other tissues and organs, including the liver, central nervous system and the immune system).

Our Defense Systems Against Air Pollutants

Pollutants in the air are carried into our airways and lungs when we breathe. Our respiratory systems have a variety of defense mechanisms against pollutants. For example, particles can be filtered out in the passages of the nose. When they are inhaled into the lungs, some are trapped in mucus and transported up into the esophagus; others are surrounded and destroyed by special cells. Sneezing and coughing help prevent the entry of both irritating gases and dusts into the rest of the respiratory system. Some gases that are inhaled into the lungs and absorbed into the bloodstream can be detoxified by the body.

Despite all of these mechanisms, some pollutants gain entry to and remain in the body. If they stay within the lungs, they can cause ongoing or periodic irritation. If materials are absorbed into the bloodstream, they can be carried to other parts of the body, where they can cause damage to organs such as the kidneys or liver.

What Can We Do?

Prevention is the best way to avoid the build-up of harmful substances in the air of our indoor environments. The careful use of pesticides, cleaning compounds and other chemicals in the home reduces exposure to potentially toxic gases and vapors. Maintaining cooling and heating systems properly, making sure that sufficient fresh air flows into buildings, and eliminating damp places where mold and bacteria grow all contribute to a healthier indoor environment.

Some Common Indoor Air Pollutants

- Particles and chemical by-products of combustion (from heating, cooking or smoking)
- Mites and parts of dead insects
- Mold spores
- Animal dander
- Formaldehyde (chemical used in building materials, fabrics and foam insulation)
- Household chemicals (paints, cleaners, ammonia, etc.)
- Personal care products (hairspray, acetone in products like nail polish remover, etc.)
- Lead dust (from old paints)

7. Dust Catchers

Background

Dust and other particles found indoors can come from a variety of sources and may include any or all of the following: cigarette smoke, animal dander (flakes of dead skin), insect parts, mold spores, fibers, and dust mites and their droppings.

Indoor dust can pose a significant health problem to individuals who are allergic to one or more of the components of dust. Animal dander, mold spores and dust mites are especially common indoor allergens (allergy causing agents). They can cause simple allergies of the upper respiratory system ("hay fever"-like symptoms). Dust mites also have been linked to more serious allergic diseases of the airways, such as asthma.

Several measures are useful for controlling dust in indoor environments. Filters help remove larger particles from the air. Keeping living areas dry and well ventilated also is helpful, as molds (and dust mites, which can feed on molds) prefer damp places. Eliminating curtains and other materials that hold dust may be necessary, in some cases, to help control allergies in susceptible individuals.

Set-up

Assemble a "dust catcher," as described on the Make a Dust Catcher page, for the students to use as a model as they construct their own. When building dust catchers, arrange your students in groups of four to facilitate the sharing of materials. Each student should make his or her own dust catcher.

Links

This activity may be taught along with the following components of the My World Indoors unit.

Adventures:
Mr. Slaptail's Secret, revisit science boxes on pages 3 and 7
Explorations:
Cover activity
Not Such a New Issue, page 5

Procedure

Getting Started (30-45 minutes)

1. Create a small dust cloud by clapping a chalk eraser against a surface (or by using cotton balls dipped in cornstarch, baby powder or baking soda). Shine a flashlight through the dust cloud. Ask, *What are we seeing? Do you think this always is in air? How could we find out?*
2. Show the students the dust catcher that you have made and explain that they will each make a similar one to take home. They will place the dust catchers in areas that they predict will

CONCEPTS

- Dust consists of individual particles of different substances.
- Even air that appears to be clean may contain dust and other pollutants.

OVERVIEW

Students will make a simple device to collect particles from the air at home or in the classroom.

SCIENCE & MATH SKILLS

- Observing
- Measuring
- Estimating
- Graphing
- Drawing conclusions

TIME

Preparation: 30 minutes
Class: 30 minutes to make collectors; 30-45 minutes to observe particles; 30-45 minutes to make graphs

MATERIALS

- flashlight (for demonstration)
- dusty chalk eraser or cotton balls and cornstarch, baby powder or baking soda (for demonstration)
- overhead transparency or copies of "Make a Dust Catcher"
- construction paper ($^1/_2$ sheet per student)
- graph paper ($^1/_4$ sheet per student)
- double-sided cellophane tape, "chapsticks," or petroleum jelly and waxed paper
- glue
- rubber bands (one per student)
- scissors
- magnifing glasses (preferably one per student)
- microscope (optional)

have the most air pollution in their houses. After one or two weeks, they will bring the dust catchers back to school and examine them for particles.

3. Guide the students as they construct their dust catchers as described on Make a Dust Catcher.
4. Have the students take their dust catchers home for one or two weeks.

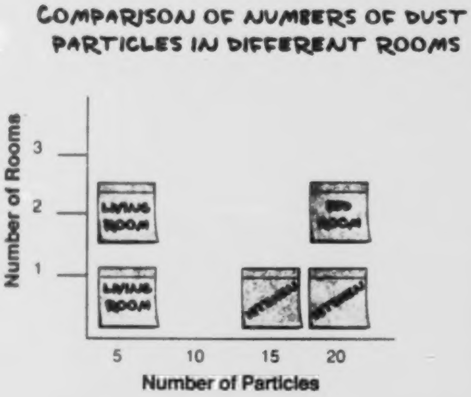
Observing (30-45 minutes)

1. Once all the students have brought their dust catchers back to school, open a general discussion about the appearance of the dust catchers. (Some will have a visible sprinkling or layer of particles; others will have few or no visible particles.)
2. Have the materials managers collect enough magnifiers for their groups. Each student should examine the overall appearance of the dust on his or her collector and, if time permits, on the collectors of other members of the group.
3. Have each student count the number of particles in one to four squares chosen randomly on the grid, using a magnifier. (You may need to vary the number of squares counted depending on the type of graph paper used. Paper with a grid size of approximately 0.5 cm works well.)
4. Have each student record the number of particles he or she counted in the appropriate place on the Make a Dust Catcher sheet (if you have made a copy for each student) or have them write the number in their journals or notebooks.
5. If you have one or more microscopes available, help the students examine their grids under higher magnification. You may want to trim the construction paper around the graph paper square to help it fit under the microscope.
6. Ask, *What kinds of particles did you capture?* Small hairs, tiny pieces of ash, crumbs and bits of thread or lint are some of the things that students will be able to see on their dust catchers. With the aid of microscopes, students also may see pollen grains, pieces of molds and very small insect parts. Have them draw some of the particles that they observed.
7. For further discussion, refer students to the various sources of household dust pictured on the front cover of the Explorations component of this unit.

Graphing Results (30-45 minutes)

1. Conduct a brief survey of the values that students obtained for their dust counts. Create a chart on the board similar to the one at right, taking into consideration the range of counts reported by the students.
2. Help each student place a dot or "sticky note" labeled with the type of room that he or she tested on the appropriate place on the graph.

Dust mites are too tiny to be seen even with a magnifying glass or low power microscope. More than 5,000 of them can fit on a fingernail!



Create a graph of student observations of the Dust Catchers.

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3. Discuss the results of the survey with the class. Ask them to identify areas in the house that have more or less dust. Also ask, *Did different kinds of dust collect on dust catchers in different rooms?* Talk about ways in which dust can be reduced or eliminated.

Variations

- Older students may enjoy making two or more dust catchers each, so that they can compare the number and kinds of particles between different rooms in their houses or between indoors and outdoors.
- Young students may prefer making the dust catchers as a class project and positioning them in different places in the classroom.
- If anyone in the class has allergies to dust or any other substances, invite them to share their experiences with the rest of the class.

Questions to Think About

- One of the characters in the story, *Mr. Slaptail's Secret* (Adventures component of this unit), suffered from several different common allergies. Who was she? What did she do to help her allergies? Did anyone else in the story have problems with allergies?
- Indoor air pollution in the form of particles is a much greater problem in developing countries, where wood and coal still are used for cooking, than in other places. Why do you think this might be so?

Ways to reduce dust include:

- ***removing un-needed "dust catchers," such as curtains***
- ***storing little-used things in plastic bags***
- ***cleaning or changing filters in heating and cooling systems frequently***
- ***washing bedding in hot (at least 130° F) water, to kill dust mites***
- ***keeping living and storage areas dry and well-ventilated***
- ***storing food left-overs in sealed containers to discourage cockroaches and other insects***

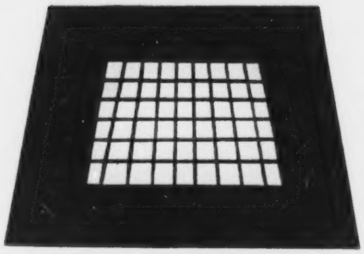
Lead and Indoor Air Pollution

Chips of old paint containing lead or lead-contaminated dust are major sources of lead exposure for U.S. children. Although lead in paint was banned in the 1970's, existing paint in older housing poses a serious health threat to children. Paints can be tested for the presence of lead using a home test kit or by sending samples to a lab. Contact your city, county or state health department if you have questions about lead and paints.

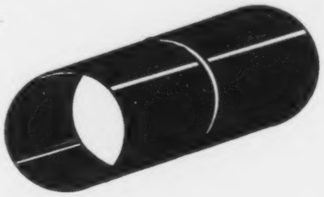
Make a Dust Catcher

You will need a half sheet of construction paper and a 10 cm by 10 cm piece of graph paper.

1. Glue the piece of graph paper onto the middle of the construction paper. Cover the graph paper with strips of double stick tape, so that the whole grid is covered with tape; OR rub a "chapstick" over the entire grid; OR cover the grid with a piece of wax paper, and glue or tape the edges. Spread a very thin layer of petroleum jelly over the wax paper.



2. Roll the construction paper into a large tube, with the graph paper on the inside. Be careful not to overlap the tape or petroleum jelly onto the construction paper. Fasten the tube with a rubber band.
3. Carefully take your tube home.



4. Remove the rubber band and spread out the Dust Catcher. Place it somewhere in your house that you think might have dust.
5. After one or two weeks, roll up your Dust Catcher. Take it to school.
6. Using a hand lens, look at the specks on the graph paper. Can you recognize any of them? Draw one of them in the space below.

7. Count the particles inside one square. Write this number here. ______

My Name ________________________________

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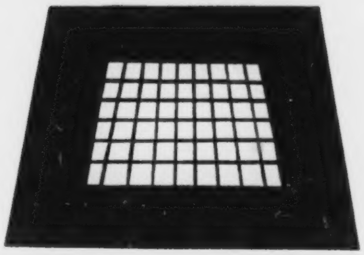
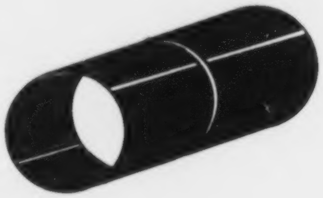
Haz un Atrapa-Polvo

Vas a necesitar media hoja de papel de construcción y un pedazo de papel cuadriculado de 10 cm por 10 cm.

1. Usa pegamento para colocar el pedazo de papel cuadriculado en medio de la otra hoja de papel. Cubre toda la superfice del papel cuadriculado con tiras de cinta adhesiva doble; O usa un "chapstick" para embarrar todo el papel cuadriculado; O cubre el papel cuadriculado con un pedazo de papel encerado y usa pegamento o cinta transparente para fijarlo. Aplica una capa muy delgada de petrolato al papel encerado.



2. Enrolla el papel para formar un tubo grande, dejando el lado con el papel cuadriculado adentro. Ten cuidado de no sobreponer la cinta o el petrolato encima del papel de construcción. Ata el tubo con una cuerda o liga.
3. Lleva el tubo a tu casa con cuidado.



4. Quita la cuerda y desenrolla el Atrapa-Polvo. Ponlo en algún sitio en tu casa donde crees que haya polvo.
5. Después de una o dos semanas, enrolla el Atrapa-Polvo y llévalo a la escuela.
6. Usa una lupa para examinar las partículas que fueron atrapadas en tu Atrapa-Polvo. ¿Puedes identificar algunas de ellas? Dibuja una de ellas en el espacio abajo.

7. Cuenta el número de partículas dentro de uno de los cuadritos del papel. Escribe este número aquí. ____________

Mi Nombre ____

8. Fungus Among Us

Background

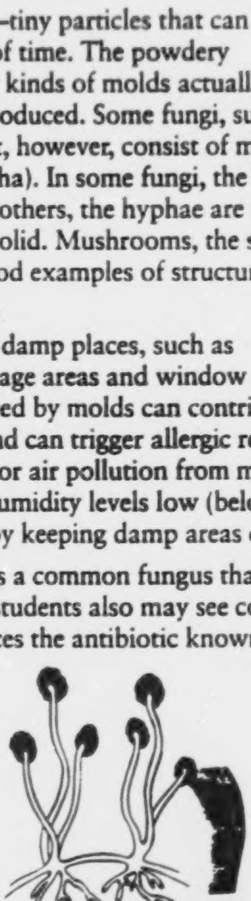
"There's a fungus among us" is an old saying that contains an element of truth. Members of the fungus kingdom (collectively known as fungi) are found almost everywhere. The fungi, along with some bacteria and other organisms, are the decomposers of our world. They break down the remains of dead plants, animals and other living things and, in the process, obtain the energy that they need to grow and reproduce. There are at least 100,000 different species of fungi.

Fungi are essential for the continued recycling of nutrients into the soil and the release of carbon dioxide into the air. However, activities of fungi can be a nuisance to humans. For example, fungi do not discriminate between fruits in a natural setting (such as ones that have fallen on the ground) and fruits in the refrigerator! Many fungi attack living organisms and are sources of diseases in both plants and animals. Fungi grow especially well in damp places and can attack cloth, paint, paper, leather, insulation on cables and even photographic film. The different kinds of fuzzy-looking fungi that grow on damp surfaces often are called molds.

Fungi spread by producing spores—tiny particles that can remain suspended in the air for long periods of time. The powdery appearance and bright colors of many kinds of molds actually are caused by the spores that they have produced. Some fungi, such as yeasts, are one-celled organisms. Most, however, consist of mats of slender tubes or hyphae (singular, hypha). In some fungi, the hyphae are loosely packed and easy to see. In others, the hyphae are packed so densely that the structure appears solid. Mushrooms, the spore-producing parts of some fungi, are good examples of structures composed of tightly packed filaments.

Inside buildings, fungi can grow in damp places, such as basements, shower curtains, food storage areas and window air-conditioning units. The spores produced by molds can contribute significantly to indoor air pollution and can trigger allergic reactions in some individuals. Fortunately, indoor air pollution from mold spores can be controlled by keeping humidity levels low (below 30%), by improving ventilation and by keeping damp areas clean.

Bread mold (*Rhizopus stolonifer*) is a common fungus that is easy to grow and observe. In this activity, students also may see colonies of *Penicillium* (the fungus that produces the antibiotic known as Penicillin) and other related fungi.



Concepts

Fungi grow from spores.
Spores from fungi are present almost everywhere.
Fungi and molds grow in damp places.

Overview

Students will grow and observe bread mold and other kinds of common fungi.

Science & Math Skills

Predicting
Observing
Recording qualitative data
Drawing conclusions

Time

Preparation: 10 minutes
Class: One session of 20 minutes to set up cultures; daily observations of 10 minutes for 3-7 days; concluding session of 30-45 minutes to make final observations

Materials

pieces of old bread baked or brought from home by students (see Set-Up)
sealable plastic sandwich bags or small jars or plastic containers (1 per student)
eye droppers (1 or more per group)
magnifying glasses and/or elementary microscopes
disposable plastic gloves (optional)
copies of "Bread Mold Observations" sheet (1 or more per student)
transparency of "Common Bread Mold" page

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Links

This activity may be taught along with the following components of the My World Indoors unit.

Adventures:

Mr. Slaptail's Secret, revisit and discuss science box on page 21

Explorations:

Let's Talk About Indoor Air, pages 2-3

Set-up

A day or two before you plan to begin this activity, ask each student or group of students to bring a piece of bread to class (bakery-type or "natural" bread works best, instead of processed bread from commercial bakers). OR you many want to consider baking bread or having students bake bread with a parent at home, as part of this activity. Recipes are given on page 38.

If you do not wish to grow bread mold in the classroom, pure cultures can be purchased from a biological supply company. (See note on this page.)

While the common molds that grow on bread generally are harmless, some students may be allergic to the spores that are produced. Therefore, have your students observe the molds without opening the sealable bags or other containers in which they have been grown. Wear disposable plastic gloves if you plan to handle mold samples for demonstration purposes.

Have the students work in groups of four.

Procedure

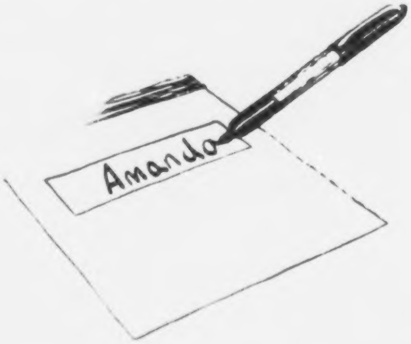
Getting Started (30-45 minutes)

1. Hold up a piece of bread and ask the students if they know who might use it for food. Prompt them to consider all the possibilities. Follow by asking if they have ever seen a rotten apple, moldy slice of bread, etc. Point out that when something is rotting, other living things are using that object for food. Ask, *How do you think these living things spread from place to place?* Remind the students of the particles they observed in Activity 7. Mention that some of the tiniest particles in dust are produced by organisms so that they can spread to other places. Tell the students that they will be able to observe some of the living things that spread in this way.
2. Have the materials managers pick up eyedroppers, tape, enough copies of the Bread Mold Observations page, and containers or sealable plastic bags for all members of their groups.
3. Have each student label a container with a piece of tape with his/her name on it.
4. Direct the students to examine their bread with a magnifing glass and draw or describe it in the first space on the Bread Mold Observations Sheet.

Pure cultures of many different kinds of common, non-pathogenic (non disease-causing) fungi may be ordered from biological supply companies. In addition to bread mold (*Rhizopus stolonifer*), most offer many other interesting members of this Kingdom, including penicillin mold (*Penicillium notatum*), yeasts (*Saccharomyces sp.*) and common black mildew (*Aspergillus niger*). These cultures are supplied on petrie plates (covered, clear plastic dishes) or in test tubes, and are easy to handle and observe. A single demonstration plate culture usually costs less than ten dollars. Most companies also sell complete kits for growing colonies of fungi.

Contact:

- **Carolina Biological Supply Company (800-334-5551)**
- **Ward's Biology (800-962-2660)**



5. Each student should place the bread in his/her container and add a few drops of water. Store the containers in a dark corner or cupboard.

Observations (10 minutes per day)

1. For the next 3-7 days, have the students observe their cultures (with and without a hand lens) at one- or two-day intervals. **Do not allow students to open the containers in which molds are growing.** Some breads may grow mold in as little as 24 hours; others may require 7 days or more.
2. Have students record their observations on their data sheets.

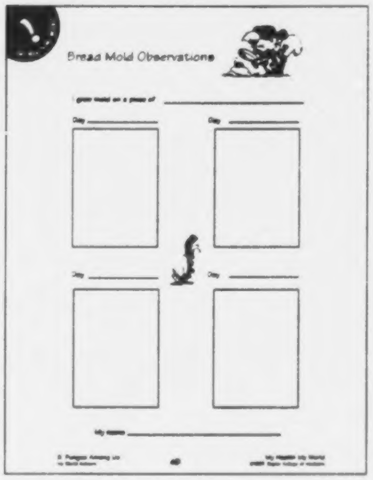
Final observations (30-45 minutes)

1. When all cultures (or almost all; some breads treated with preservatives may not grow mold within the time allowed) have visible molds, have students make their final observations.
2. As a class, decide how many different kinds of molds are present on the bread samples. Have students list the characteristics they use to tell different-looking molds apart. Have them think about whether some kinds of molds seem to grow on certain types of bread.
3. One of the fungi that will be present is bread mold. It consists of dark gray threads that form a loose, tangled mat that may reach a centimeter in thickness. Find several samples of bread mold from the class's cultures, and give a container with bread mold to each of the groups.
4. Have the students observe the bread mold inside their containers with their magnifing glasses. They will be able to see the individual threads and some small dark dots at the ends of the threads. The dots are the spore-producing parts of the fungus. (The actual spores are very tiny.) If you have access to microscopes, place a few strands of the bread mold (using forceps or tweezers) under one or more microscopes for the students to observe. They will be able to see the tubular structure of the filaments (hyphae), the round, dark heads that produce spores and, depending on the magnification, some of the tiny, round spores. Show a copy of the Common Bread Mold page to help them as they try to spot the different parts.
5. Conclude by leading the students in a discussion of the role of molds in causing indoor air pollution. You may wish to refer to the story, *Mr. Slaptail's Secret*, in which Rosie, one of the characters, is allergic to mold spores.

Variations

- Have your students invent names for the different kinds of molds they grew and create a key to help identify each one.

Cyclosporin, a "wonder drug" developed in 1979, comes from a fungus that lives in soil. This medicine is given to organ-transplant patients so that their immune systems will not attack and destroy the new tissue.



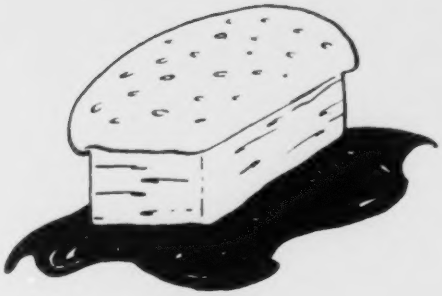
Fungi are found in many places and have numerous uses in science and commerce.

Yeasts (tiny one-celled fungi) are used for baking and the production of beer.

Many fungi are sources of antibiotics and other medicines.

Some kinds of fungi inhabit the roots of trees, crops and other plants and help the plants take up nutrients from the soil.

- Make one or more kinds of bread with your students. Try using a recipe with baking soda for leavening and comparing the results with a recipe that uses yeast (a fungus). Mention that, in both cases, the bubbles in the dough are caused by carbon dioxide gas that is released into the dough. Sample recipes are provided below.



Questions to Think About

- Where can we find molds and other fungi in the natural world? What would happen if there were no fungi?
- What can we do in our homes to eliminate places where molds can grow and spread?

Soda Bread

6 cups all-purpose flour
2 teaspoons baking powder
2 teaspoons baking soda
2 teaspoons salt

3 cups buttermilk (or add 2-3 tablespoons vinegar to 3 cups milk, stir and use as buttermilk)
Optional: mix 1 cup raisins or chopped nuts into dry ingredients

Preheat oven to 375° F. Stir flour, baking powder, baking soda and salt together in a large bowl. Add buttermilk and stir to moisten the dry ingredients. Form the dough into a ball and knead several times. Shape the dough into two round loaves about 1 1/2 inches thick. Cut an "x" on the top of each loaf. Bake for 40 minutes. Brush the top of each loaf with melted butter and cool on a wire rack.

No Knead Bread

1 1/2	cups milk
1/2	cup vegetable shortening
1/4	cup sugar
2	tablespoons salt
1 1/2	cups water
3	packages dry yeast
3	eggs
9 1/2	cups flour

Preheat oven to 350° F. Scald milk by bringing it just to the boiling point in a large, heavy pan. Add shortening, sugar and salt to hot milk. Let milk begin to cool and add water. When mixture becomes lukewarm, add yeast and mix well. Blend in the eggs and add half of the flour. Mix thoroughly. Slowly add the remaining flour. When the dough becomes too stiff to stir with a spoon, place it on a floured surface and knead briefly to blend ingredients. Shape into three loaves and place in greased loaf pans. Cover with a clean cloth and let rise for one hour, away from drafts. Bake for 45 minutes.

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Bread Mold Observations

I grew mold on a piece of ______________________

Day ____________

Day ____________

Day ____________

Day ____________

My name ______________________

Observaciones de Moho

Yo cultivé moho en un pedazo de ____________________

Día ______________

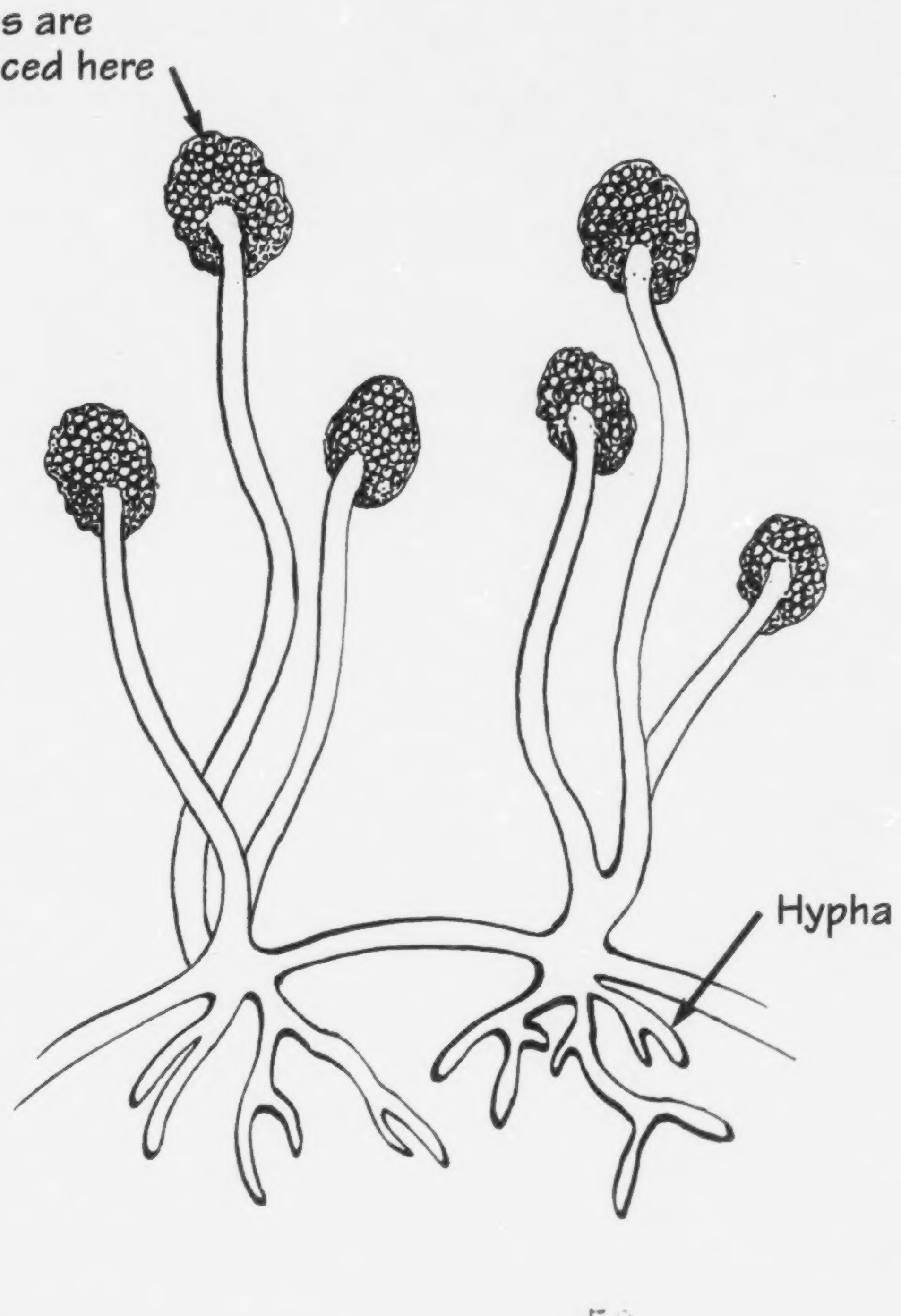
Día ______________

Día ______________

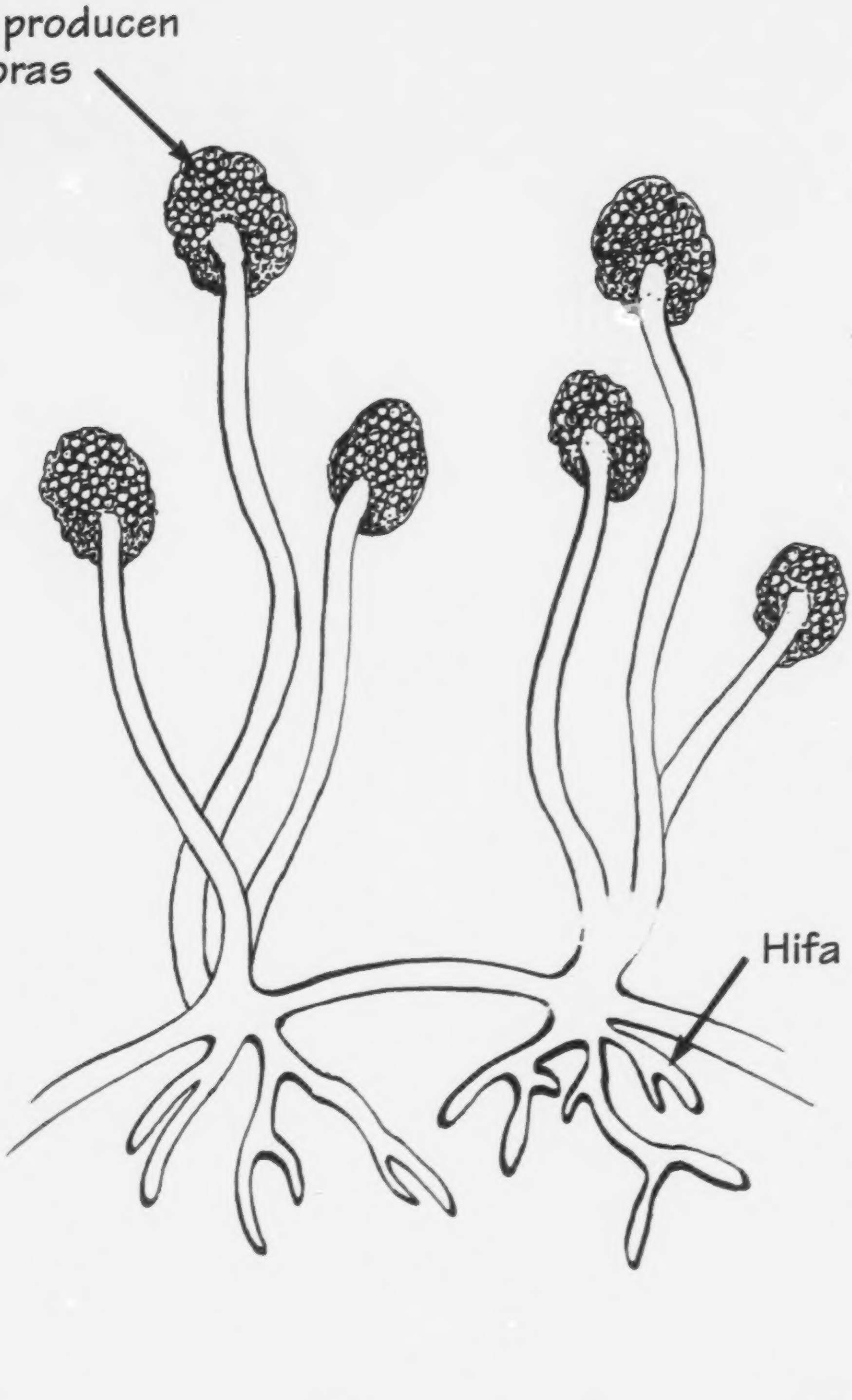
Día ______________

Mi nombre ____________________________

Common Bread Mold


Spores are produced here
Hypha

Moho de Pan


Aquí se producen las esporas
Hifa

MY HEALTH MY WORLD

9. There's Something in the Air

Background

Pollution inside buildings can occur in many ways. Some indoor pollutants are produced when something burns. These include gases such as carbon monoxide, as well as particles, like those that make up soot. Tobacco smoke introduces these pollutants and many other chemicals into the air. Other indoor pollutants, such as pollen, spores, insect parts and droppings, and dust mites come from biological sources. Formaldehyde, a poisonous chemical, often is given off by particle board, carpeting, insulating foam, some cleaners, permanent-press fabrics and tobacco smoke. These materials, in addition to many others (such as solvents and cleaners, paints, glues and dry-cleaning fluids), also contribute a number of other potentially harmful chemicals into the air.

The concentration of many of these compounds is much higher indoors than outdoors. In order to conserve energy, many modern homes and buildings are designed to prevent air leaks or the introduction of outside air into heating or cooling systems. This allows chemicals and other substances to become concentrated in indoor air.

To reduce indoor air contaminants, heating and cooling systems should by serviced regularly. Humidifiers and air conditioners should be cleaned frequently to reduce places where molds and bacteria can multiply. New buildings should be ventilated thoroughly before being occupied. Other measures that can be used to reduce the build-up of harmful pollutants indoors are given on page 3 of the My Health My World Explorations mini-magazine, *My World Indoors*.

Links

This activity may be taught along with the following components of the My World Indoors unit.

Adventures:
- *Mr. Slaptail's Secret*, revisit science box on page 25

Explorations:
- Tips for Healthy Living, page 3
- We Can Make a Difference, page 6

Set-up

Before conducting the activity, measure and cut yarn or string into 6 m pieces (one piece for every three students in your class). With a marker or pieces of tape, make lines at 2 m, 4 m and 6 m points (adjust distances depending on the size of your classroom) on each piece of yarn. Older students can mark their string segments themselves.

Many kinds of gases and particles travel through and become dispersed in air. Substances in air stay concentrated in enclosed spaces.

Students will compare the dispersal of odors indoors and out-of-doors, as a model for the movement of pollutants in indoor and outdoor air.

Observing
Measuring
Comparing data
Drawing conclusions

Preparation: 20 minutes
Class: 15 minutes indoors; 15 minutes outdoors; 20 minutes to compare results

pieces of heavy yarn or string (one 6 m long piece for each three students)
meter stick or tape measure
timer, clock or watch with a second hand
orange
sharp knife (optional)

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This is a whole-class activity that can be carried out as a discovery lesson without prior introduction.

Procedure

Indoors (15 minutes)

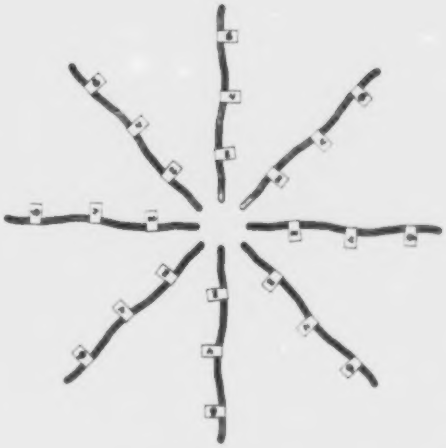
1. Arrange the pieces of yarn on the floor like spokes of a wheel around a central point in the room. Divide the class into three groups. Tell the members of one group to sit on the 2 m marks on the various pieces of yarn, the second group on the 4 m marks and the third on the 6 m marks.
2. Stand in the center of the "wheel" holding the orange. Before you proceed, tell the students that they should raise their hands as soon as they smell the scent from the orange.
3. Begin to peel the orange, hold it in your hand and turn around slowly. Record (or have one or more students observe and record) the times when approximately $^3/_4$ of the students at each distance have raised their hands.
4. On the board, create a class graph showing the time it took for each distance group to smell the orange. (Leave the graph on the board until after you have conducted the outdoor portion of the activity.)
5. Use the graph to talk about odors traveling through the air. Ask questions such as: *Which group smelled the orange first? Which one smelled it last? Why do you think that happened?*

Outdoors (15 minutes)

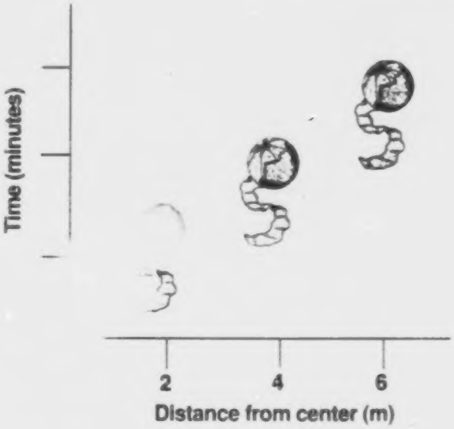
1. Repeat steps 1 through 3 in an outdoor location.
2. After returning to the classroom, make a second graph, using the same scale as on the first, to show the time required for odors to travel outdoors. Compare the two graphs, and discuss differences. Ask questions such as: *In which area did you smell the odor more quickly? Was the odor stronger in either place? Could everyone smell the scent in both locations? Why do you think that happened? (In most cases, the scent will be noticed more quickly indoors. However, air currents indoors and breezes out-of-doors may affect the results. Discuss these variations with the class.)*

Compare and Contrast (20 minutes)

1. In a class discussion, relate this experiment to how things travel in air (Activity 3), and how pollutants can become concentrated in indoor environments. Ask questions such as: *What do you think an odor is?* (It can be a gas or tiny particles of liquid floating in the air. Introduce the idea that many kinds of gases and particles float in air all the time.) *What happens when things floating in air get trapped inside a room? What if it were a harmful gas? How could pollutants in air enter our bodies?*



Arrange the marked pieces of yarn on the floor around a central point.



Create a class graph showing the times required for each group to smell the scent of the orange.

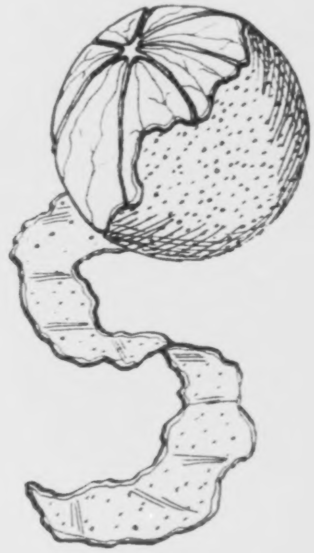
Variations

- Try this activity with different scents, such as those from perfumes, air fresheners, vinegar, etc.
- Stand in front of a fan or other source of moving air while peeling the orange. Have students predict whether this will affect the distribution of orange scent in the room.
- Have students return to the outside location where they conducted their test, 30 minutes or so after finishing the activity. Can they still smell the orange? What about inside the classroom, is the orange scent still detectable?

Questions to Think About

- Do different odors disperse at different rates?
- What are some things we could do to prevent harmful substances (for example, dust, chemicals, pollen) from building up inside our classrooms or homes?

Asbestos is an indoor pollutant that often is discussed in relation to schools. A naturally-occurring mineral, asbestos is fireproof, a good insulator and virtually indestructible. It was used in many buildings until 1980. Unfortunately, asbestos fibers have been linked to lung disease, when they are inhaled over long periods of time. People living or working in buildings with asbestos, however, only need to be concerned if the asbestos is shedding.



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10. Healthy Homes

CONCEPTS

We are able to influence many aspects of indoor air quality.

OVERVIEW

Students will conduct a survey of potential indoor air hazards at home and discuss ways in which they can be decreased or eliminated.

This activity may be used for assessment.

SCIENCE + MATH SKILLS

- Observing
- Recording observations
- Drawing conclusions
- Applying prior knowledge to a new situation

TIME

Preparation: 10 minutes
Class: 30 minutes for introduction of activity; 30 minutes to discuss students' observations and draw conclusions

MATERIALS

Copies of "Healthy Home Survey" (one per student)

Background

We often tend to forget that environmental problems are not restricted to outside habitats (natural or urban). For most of us, our homes, offices and schools constitute our "environments" during much of the day and night. Since we spend so much of our time inside, the quality of our indoor environments is very important.

Indoor air can become polluted from many sources. Some pollutants of indoor air are so irritating that they can bother anyone who breathes them. These include paints, asbestos fibers, smoke, cleaners, insect sprays and chemicals used on fabrics. Other polluters can cause more problems for some people. For example, some people are allergic to dust. When they breathe dusty air, people with these kinds of allergies may start to sneeze or have runny noses and itchy eyes. Once in a while, more serious breathing problems, such as asthma, also are caused by air with dust.

How can we keep the air inside our homes and other buildings clean and safe to breathe? A little common sense goes a long way. We can be careful about using chemical cleaners, paints, glues and pesticides. Or, even better, we can use products that don't pollute. We can reduce the amount of dust in the air by changing the filters in our home heating and cooling systems. We can get rid of some sources of indoor air pollution, such as tobacco smoke, completely.

Links

This activity may be taught along with the following components of the My World Indoors unit.

Adventures:
Mr. Slaptail's Secret, discuss illustration on pages 28-29
Explorations:
Worldly Words puzzle, page 5

Set-up

This activity should be introduced and summarized as a whole-class discussion. Students will work individually as they conduct their home air surveys.

Procedure

Getting Started (30 minutes)

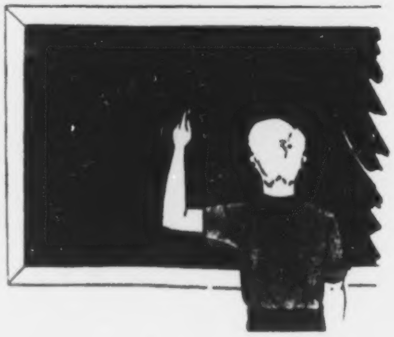
1. Ask your students to mention some of the things they have learned about indoor air. If you have used the My Health My World Explorations mini-magazine, *My World Indoors*, and/or read the story, *Mr. Slaptail's Secret*, you might use one

or the other as a basis for beginning a discussion. Otherwise, initiate a review discussion of different sources of indoor air pollution.

2. Mention that there are many things we can do at home to improve the quality of the air we breathe. Stress that before we can try to solve problems of this type, we need to look for possible sources of indoor air pollution. After sources are identified, we can decide which actions are needed to make improvements.
3. Give a copy of the Healthy Home Survey to each student. Ask the students to take their pages home and use them to conduct a survey of possible air polluters inside their homes. **Stress that an older family member or friend should help conduct the Healthy Home Survey.** Students should circle or color different areas on their sheets that might be contributing to indoor air pollution in their houses or apartments. Encourage them to draw any additional polluters that they encounter during their surveys.

Looking at Results (30 minutes)

1. Invite the students to share their survey results with the class. Create a list on the blackboard of different home air quality hazards that have been identified or make a transparency of the Healthy Home Survey and make annotations while you project it as an overhead.
2. After the list is complete, ask students to suggest ways in which hazards can be decreased or eliminated. Do this as a whole-class discussion, or ask each student to write a paragraph about ways to improve indoor air quality.
3. Refer students to pages 28 and 29 of *Mr. Slaptail's Secret.* Ask them to find the different ways Mr. Slaptail's neighbors were able to eliminate indoor air pollution in his house.
4. Display the students' Healthy Home Surveys.

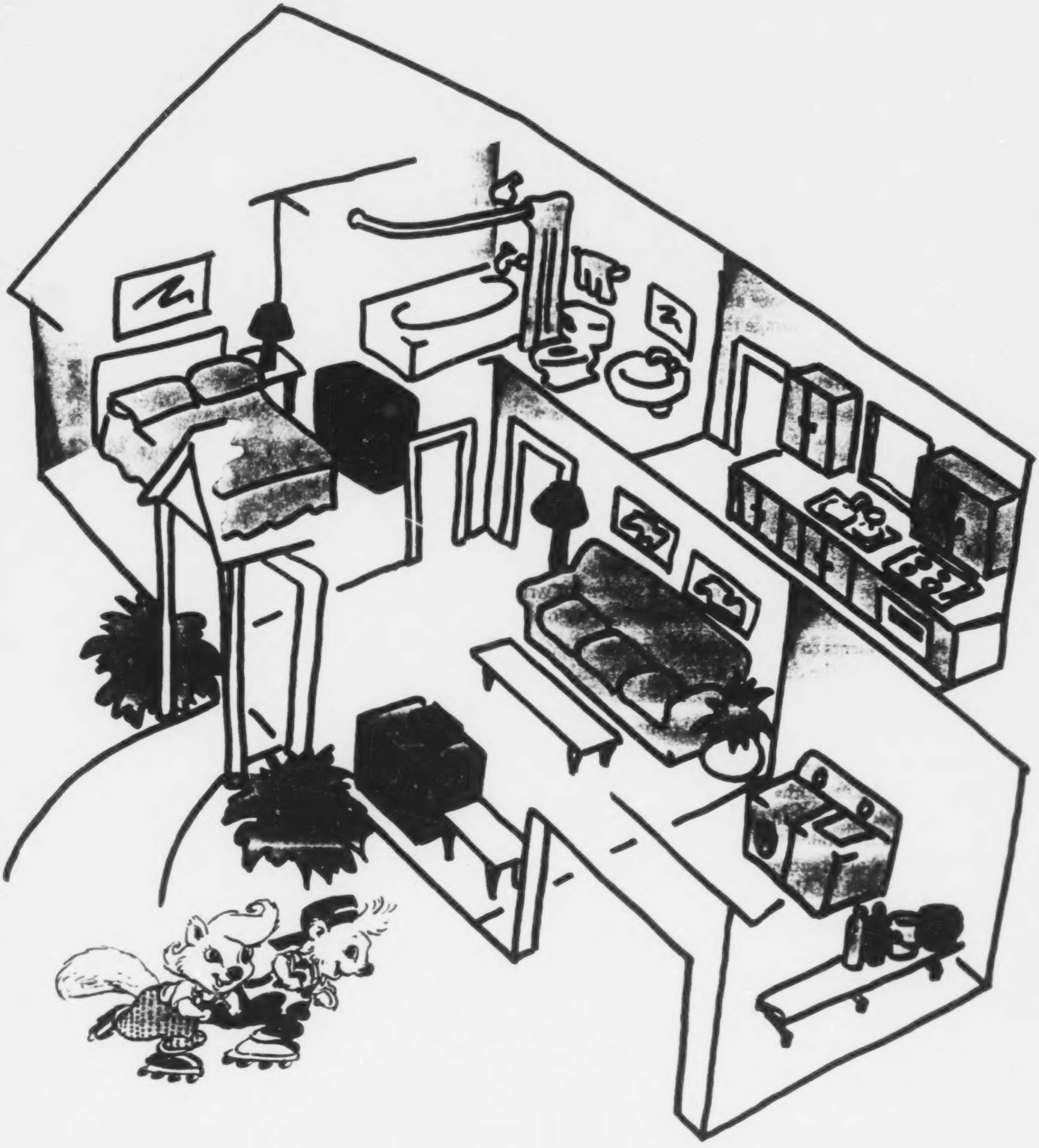


Variation

- Conduct a "Healthy Home Survey" in your school building. Let students work in teams of 2-4 and assign them to different parts of the building. Bring the class together to discuss students' observations and make a list of possible improvements. Also, be sure to identify measures already being taken in the building to maintain a clean indoor environment.

Healthy Home Survey

Encuesta de Casas Saludables



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My Health My World® Adventures
Developed by
Baylor College of Medicine
Houston, Texas
ISBN 1-888997-10-3

MY HEALTH MY WORLD
MY WORLD INDOORS

MR. SLAPTAIL'S SECRET

RIFF AND ROSIE

Written by Judith Dresden, Barbara Tharp and Nancy Moreno
Illustrated by T Lewis

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The **My Health My World**® series for health and science education provides:

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My Health My World® Adventures

MR. SLAPTAIL'S SECRET

by

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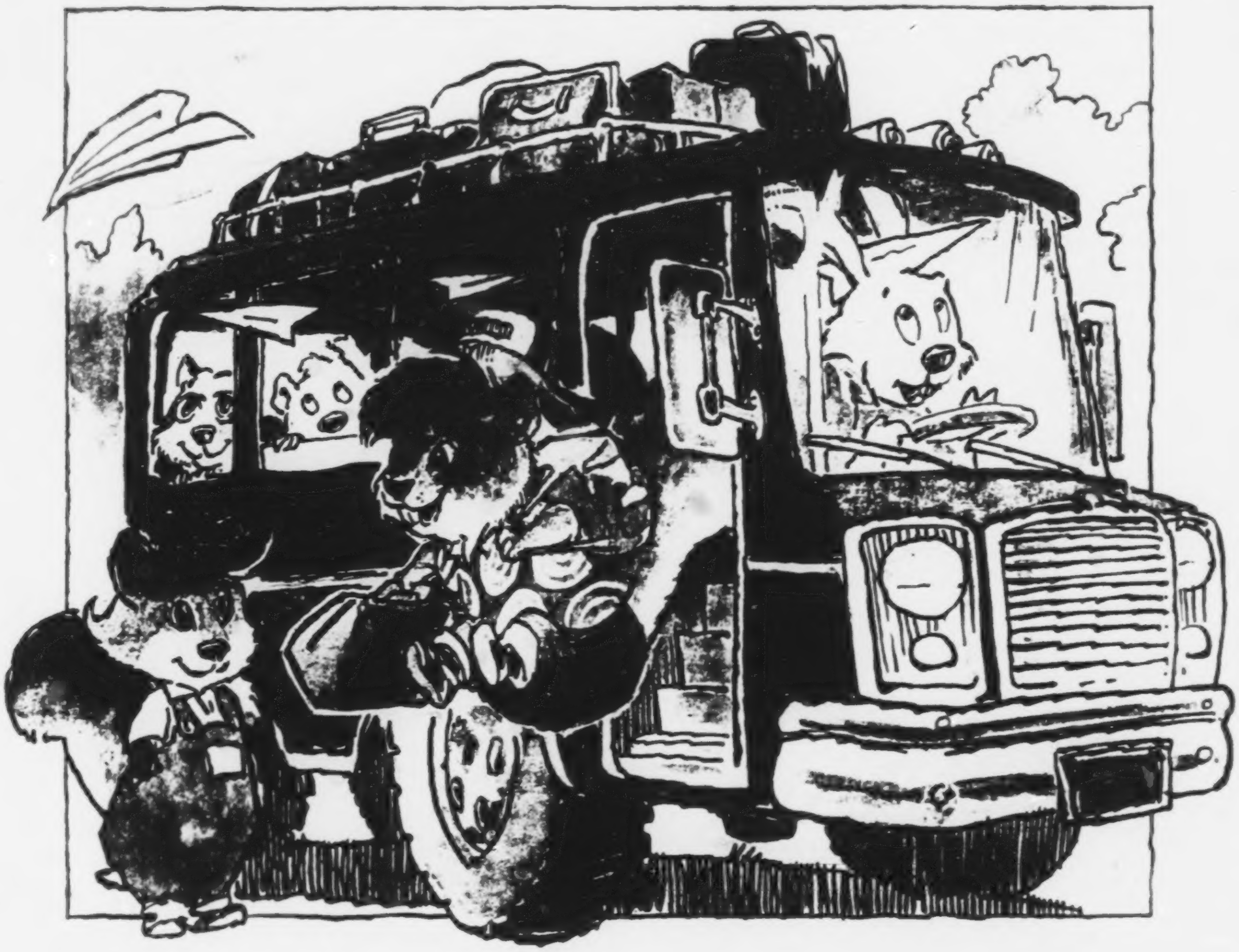
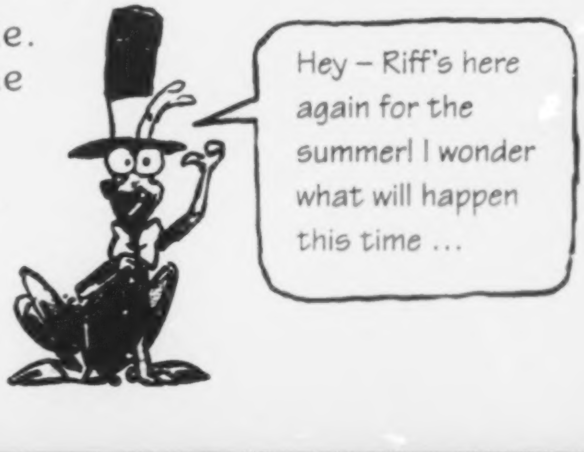
Nancy Moreno, Ph.D., Director
William Thomson, Ph.D., Co-Director
Judith Dresden, M.S.
Barbara Tharp, M.S.
Celia Clay, M.P.H.



"Be sure to throw your planes with the nose up," Riff yelled to the passengers as he leaped from the bus.

"I'm here!" Riff hollered to his cousin, Rosie, who was waiting for him at the bus stop.

"Same old Riff!" said Rosie. "I see you got everybody on the bus to make airplanes." Riff grinned and took off toward Rosie's house, tossing a paper plane as he ran.


Hey – Riff's here again for the summer! I wonder what will happen this time ...

That night in the playroom, Rosie sorted astronaut cards and Riff played with one of his cousin's spaceships. Soon he set it back on the shelf, sat down and pulled some pieces of an old telephone from his bag. He blew dust off of them and said, "Let me show you all the cool stuff I brought!"

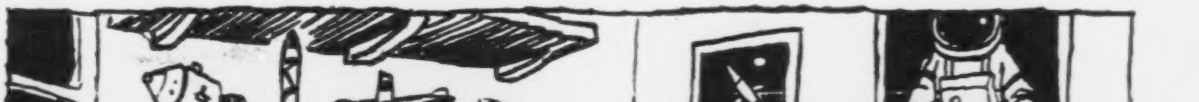
"What did you – AAA-CHOO! – bring this time?" Rosie asked. Suddenly she began to sneeze, and she couldn't stop.

"What's making you sneeze so much?" asked Riff. "You're going to blow your cards away!"

"I think I'm allergic to you," Rosie answered.

"Allergic?! How can you be allergic to me?" Riff said.

"Well, I don't know, but I used to sneeze a lot before we got rid of the dust catchers in this room. You make me feel the same way!" said Rosie.



Tiny things in dust can make some people sneeze and have a runny nose. This is a kind of allergy. Allergies happen when the body reacts to something that usually is harmless, like pollen, molds, certain foods or insect stings.

Looks like Rosie's allergic to something in here.

Me too!
AAA-CHOO!

"Dust catchers?" Riff said. "Like what?"

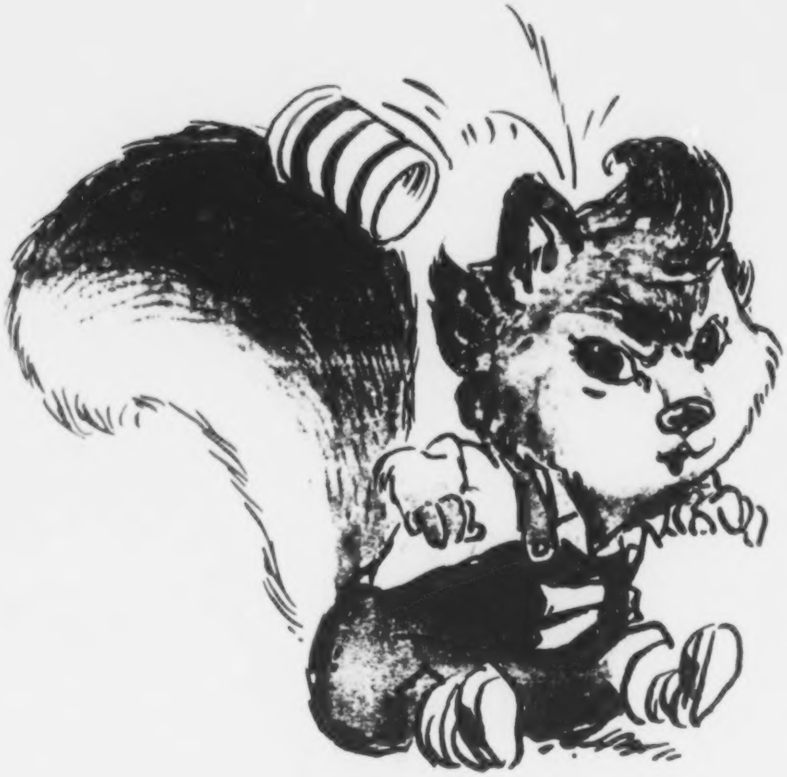
"Like curtains and rugs and stuff that hold dust," Rosie answered. "I'm allergic to dust."

"Thanks a lot. Now you're calling me a dusty old rug!" Riff replied.

"Well, I just started sneezing when you brought in your dusty old stuff. You figure it," Rosie said. "Get that junk out of here. Keep it in your own room!"

Riff wasn't ready to go to his room yet. How could Rosie think his prized possessions from home were junk? He'd show her all the super things he could do with them! All she ever wanted to do was play with astronaut stuff.

Rosie sneezed again and blew her nose. "We need some fresh air," she muttered as she opened the window.



Riff dumped out the rest of his treasures and turned them over in his hands, one by one. There was his home-made flyer – his favorite. He tossed it gently in the air.

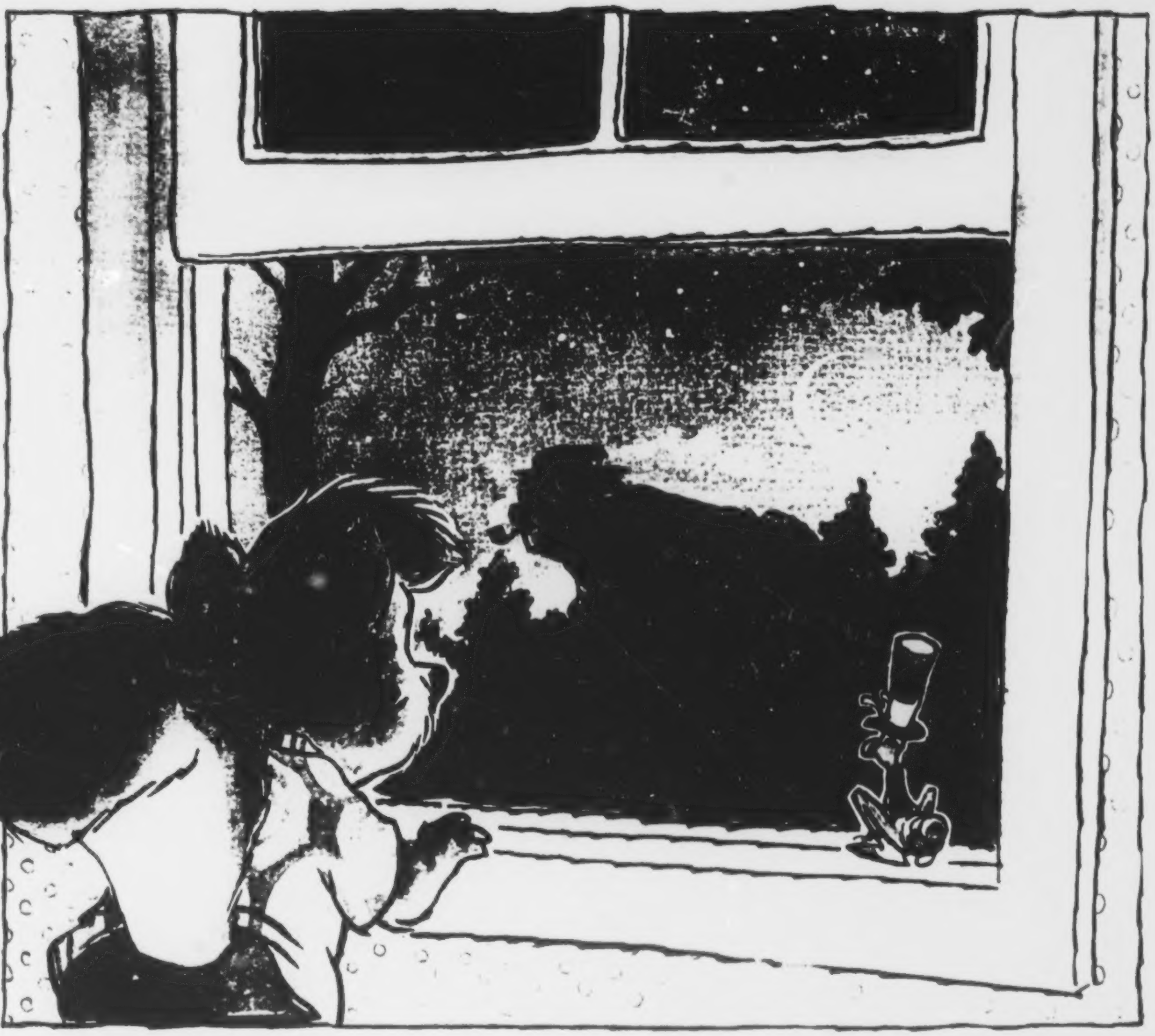
Uh-oh! There it went, gliding straight toward his cousin's head.

"Ouch! What's this?" Rosie yelled. She grabbed the metal tube from the floor and threw it. It soared through the window and out of sight.

"You just threw my flyer out the window!" Riff yelled. "You'd better get it back!"

"What are you talking about? What flyer?" Rosie asked. "You hit me with a can! Who cares about an old can?"

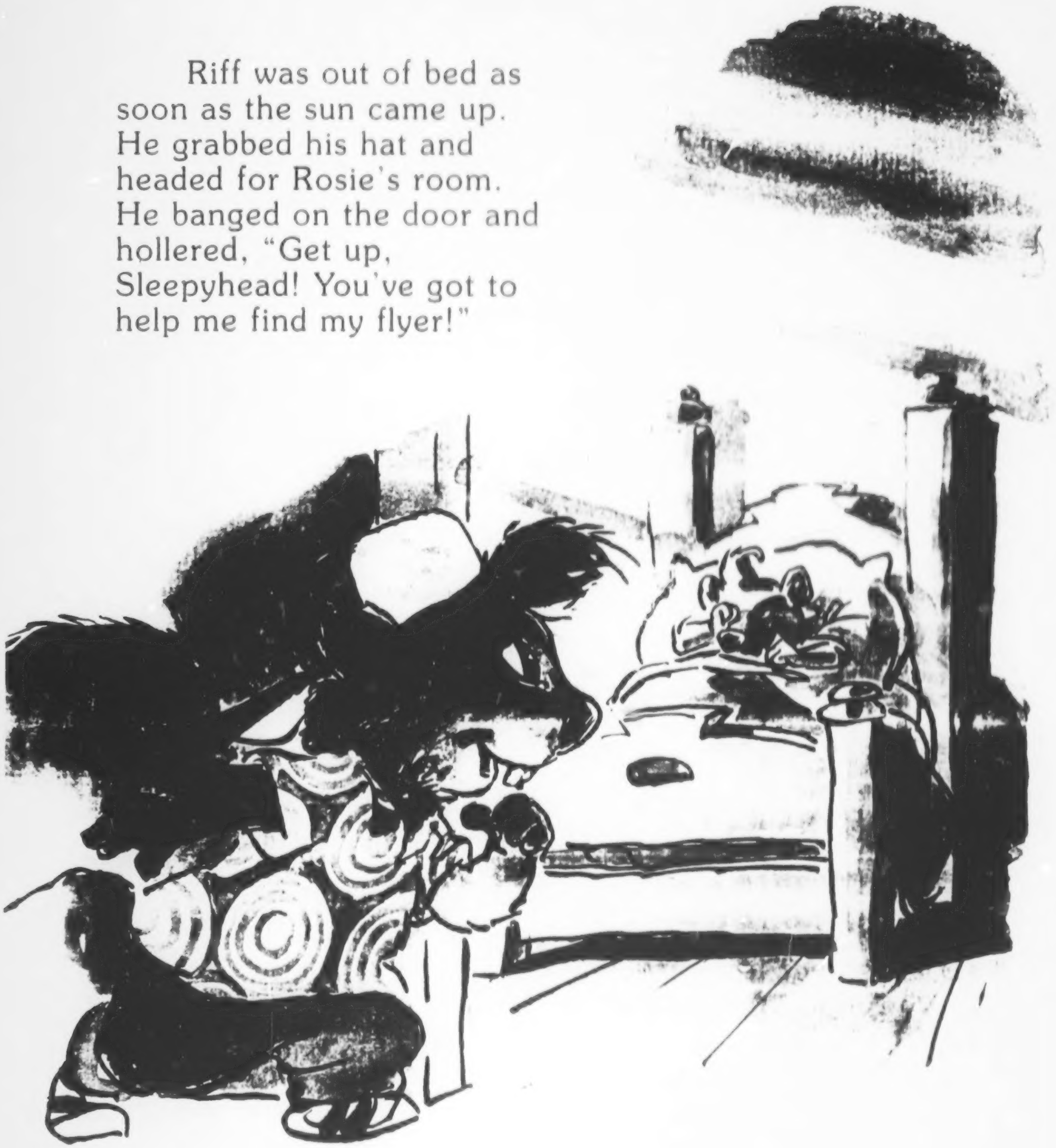
"I care! It's my special flyer. Grandpa made it from a soda can, and it really does fly," said Riff. "I bet it went a mile. How will I ever find it?"



Riff ran to the window. He knew he couldn't hope to spot his flyer tonight – but he saw something moving down the road in the moonlight.

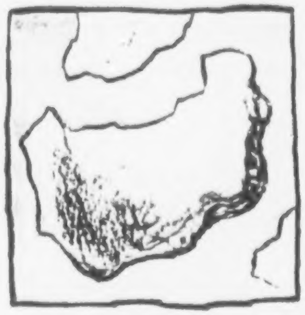
"What's that guy dragging in such a big bag?" Riff said with a shiver. "He sure looks creepy!"

Riff was out of bed as soon as the sun came up. He grabbed his hat and headed for Rosie's room. He banged on the door and hollered, "Get up, Sleepyhead! You've got to help me find my flyer!"

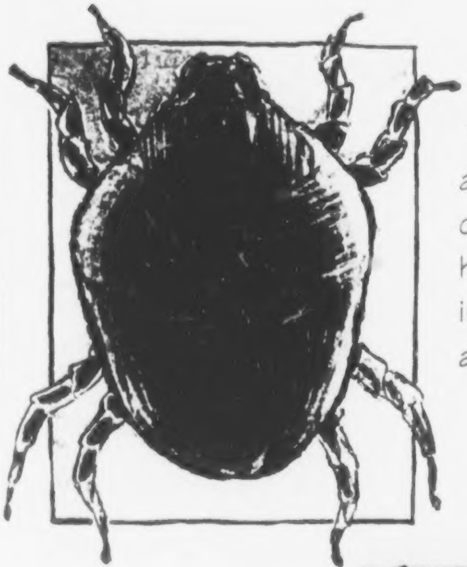


Rosie popped her eyes open, sat up straight and stammered, "What happened? An earthquake?" Then, looking at Riff, she threw herself back down on her pillow. "Oh, yeah ... it's you."

Ouch! That sun is bright! It even shows the dust in the air. Dust is everywhere. Here – look under my microscope at all these different things in dust. All of these can cause allergies in some people.

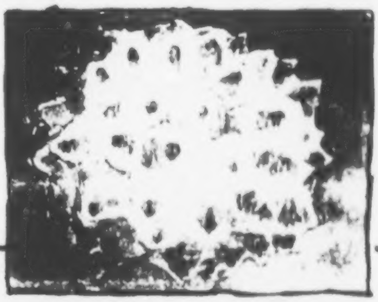


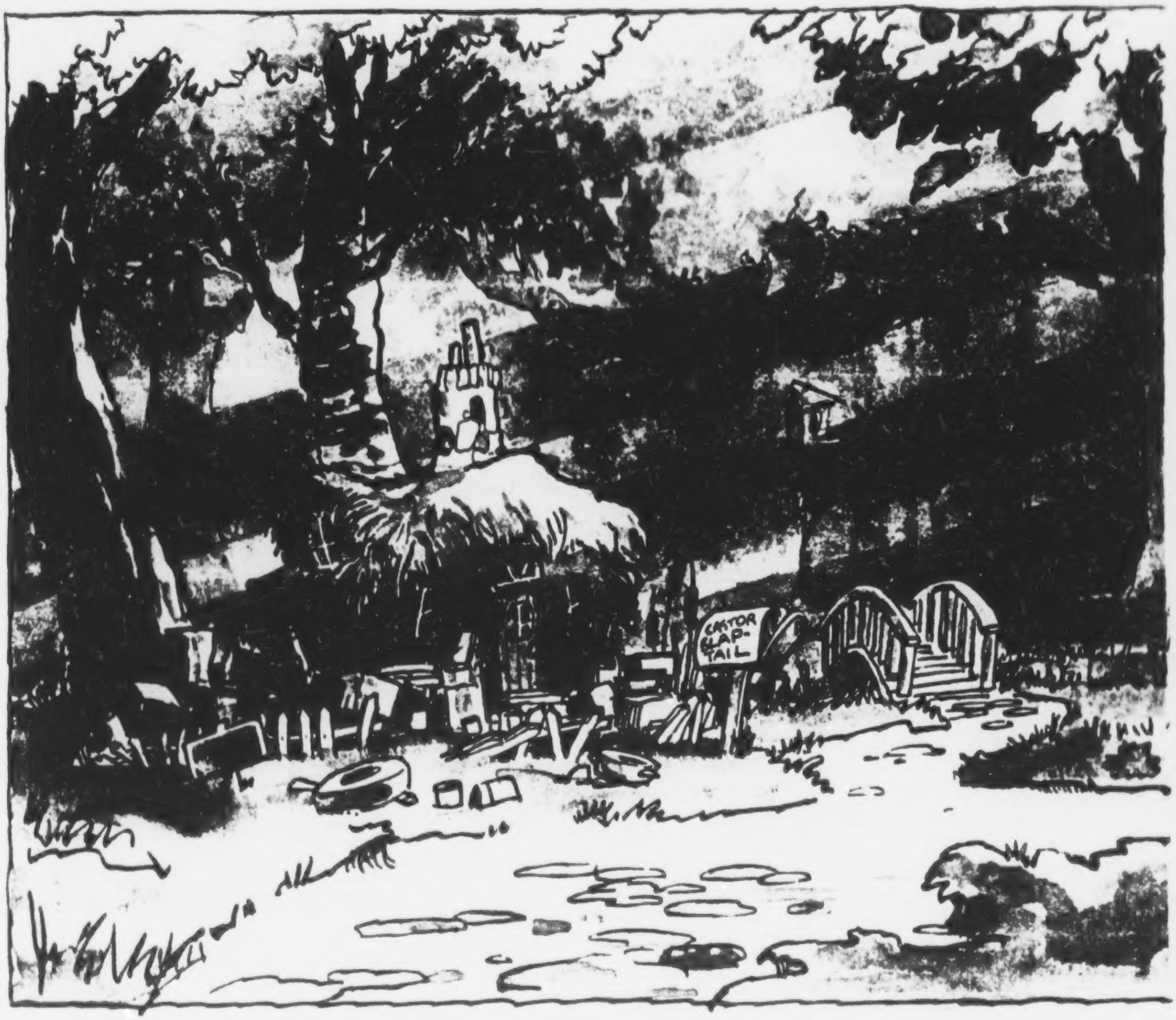
Over here is a tiny flake of dry skin.



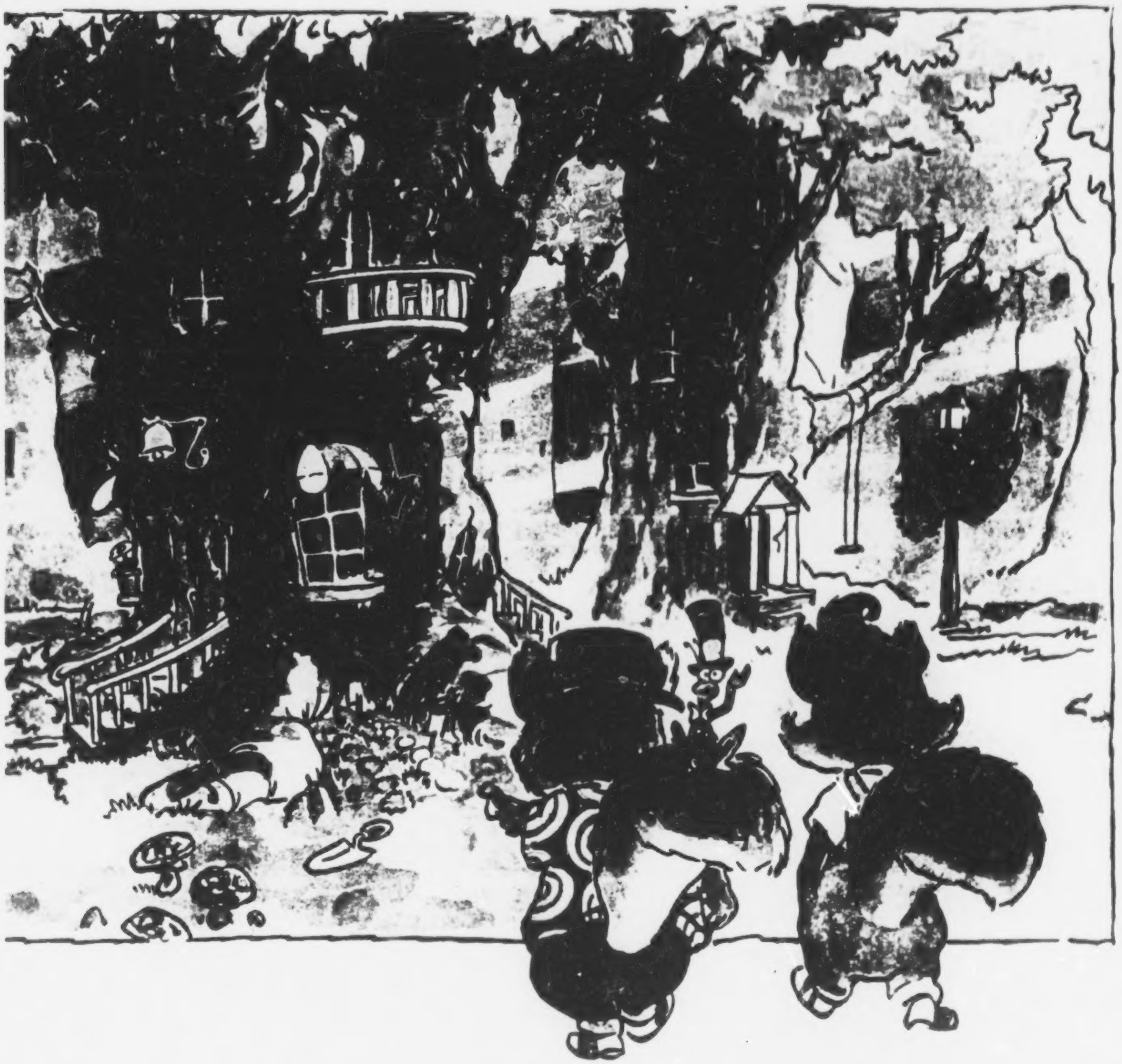
This little critter is a dust mite. You can't see him, but he likes to live inside mattresses and soft furniture.

The one with spikes is a pollen grain from a flower.





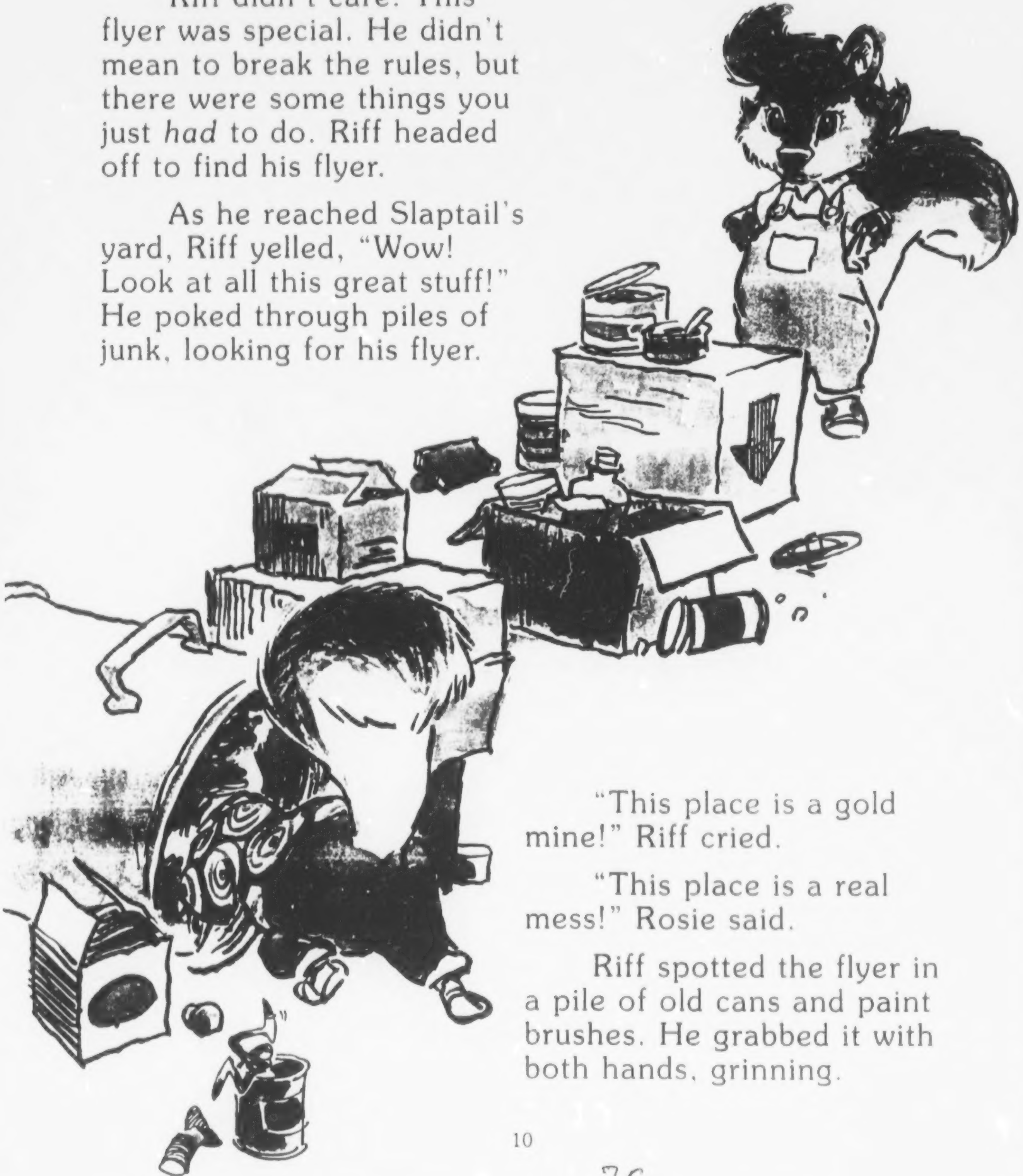
They searched the yard for Riff's flyer. "I know it isn't here," Riff said. "It must have gone farther, and it would have drifted to the left. Look," he said, pointing, "it has to be in that junk yard over there."



"How do you know it drifted to the left? And anyway, that's not a junk yard. That's old Slaptail's house," said Rosie. "It's a mess. He never talks to anybody, and we aren't allowed to go into his yard."

Riff didn't care. This flyer was special. He didn't mean to break the rules, but there were some things you just *had* to do. Riff headed off to find his flyer.

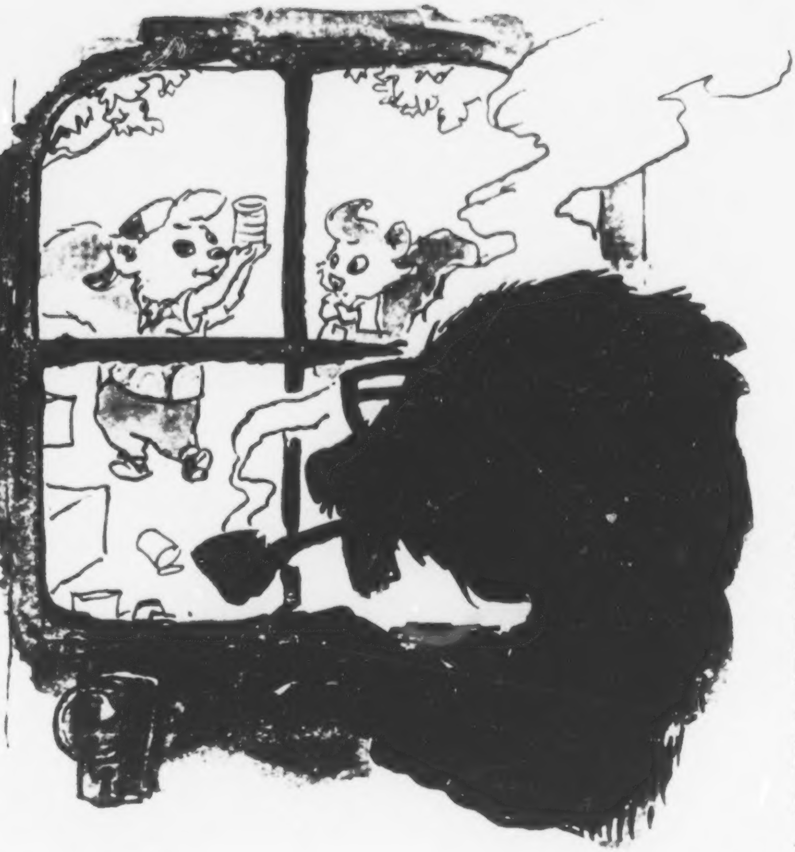
As he reached Slaptail's yard, Riff yelled, "Wow! Look at all this great stuff!" He poked through piles of junk, looking for his flyer.



"This place is a gold mine!" Riff cried.

"This place is a real mess!" Rosie said.

Riff spotted the flyer in a pile of old cans and paint brushes. He grabbed it with both hands, grinning.



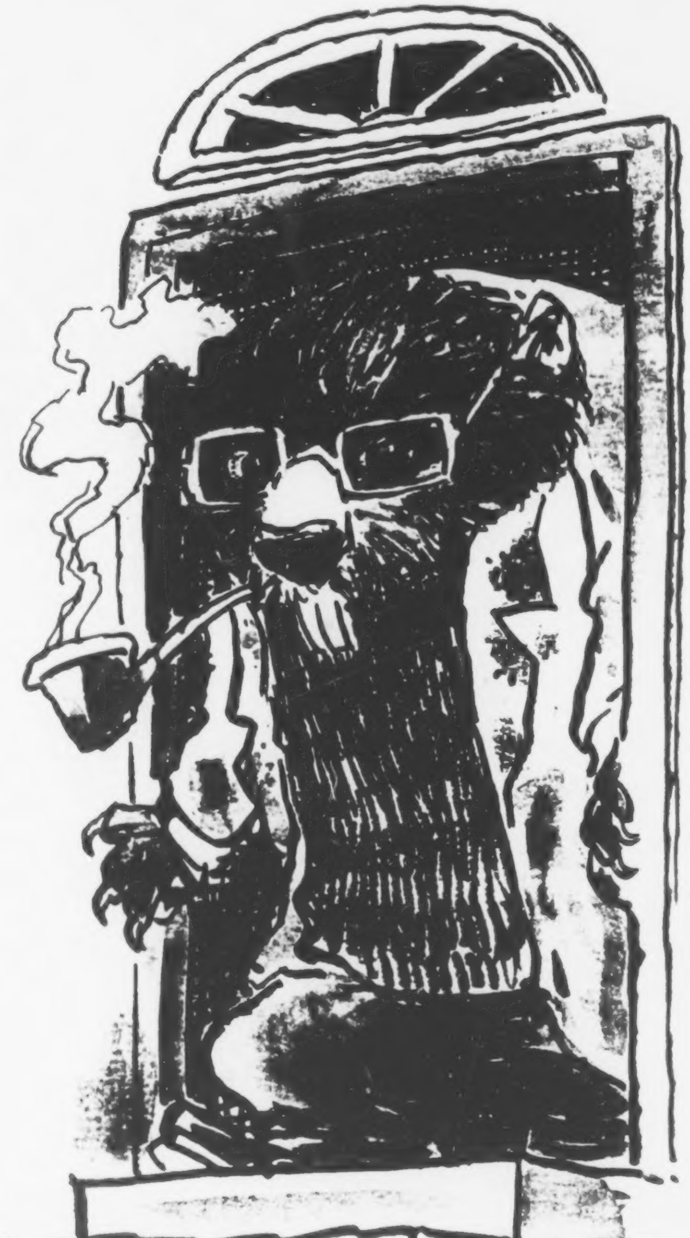
Suddenly there was a sharp, squeaky noise, and both cousins turned toward the house. The door opened slowly, letting out a mixture of odors – smoke, paint, and other strange smells.

From the dark doorway a craggy voice demanded, "What are you doing here? What do you want?"

Riff stepped toward the house and said, "We're sorry, sir. My flyer landed in your yard, and we just came to get it."

The old man took the pipe out of his mouth and coughed. Finally he said, "Get off my property!"

"I really like your stuff," said Riff, boldly. "You must be Mr. Slaptail. I'm Riff. My cousin Rosie's house is just over there. I collect stuff too. Do you make things with it?"



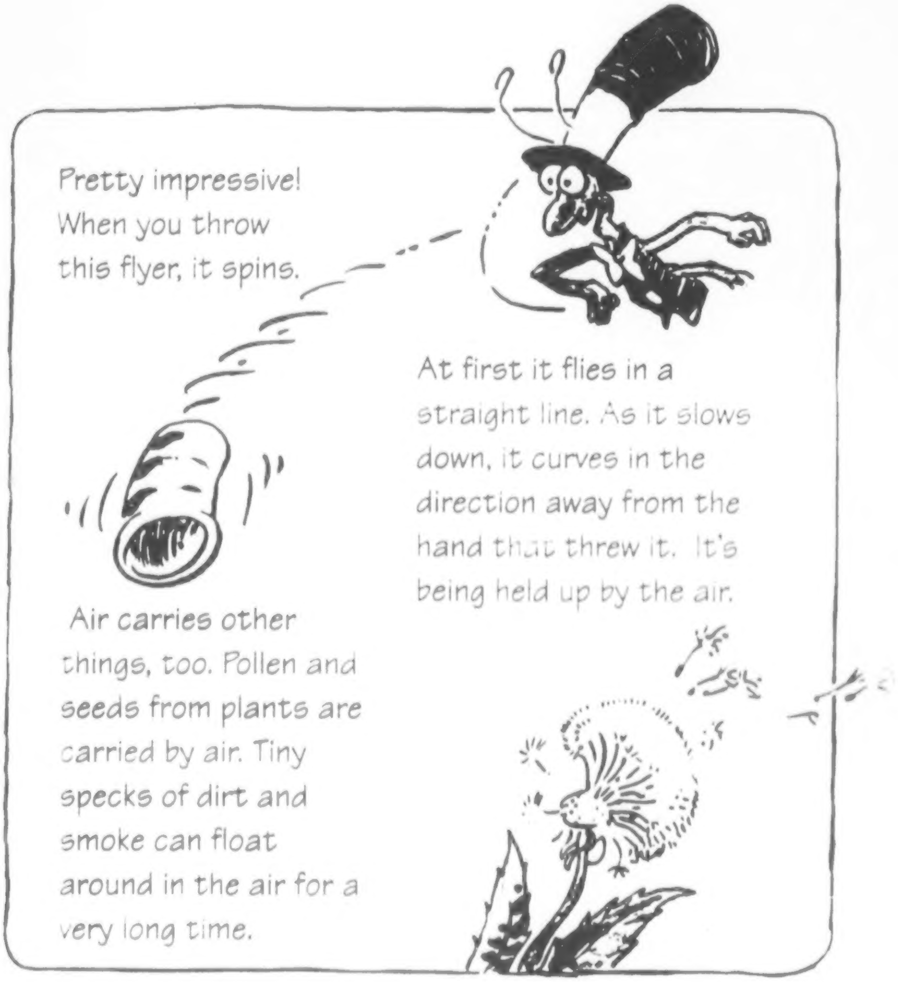
"Hrrumph ...," Mr. Slaptail mumbled. "What I do is my business. What's this 'flyer' you say came into my yard?"

Riff handed him the hollow can. "See? Here it is," he said.

Mr. Slaptail said, "This is just a soda can with no ends. Are you trying to trick me? Kids are always trying to get in here and make trouble." He threw the can down, and it didn't fly. It just hit the steps. "Flyer, indeed!" he said gruffly.

"But it really does fly, if you throw it right. It's amazing! Last night it flew all the way over here from Rosie's window," Riff explained. "Not bad, huh? Rosie threw it with her right hand, so it was spinning clockwise and curved to the left – right into your yard."

"You don't say!" said Mr. Slaptail. He almost smiled. "Hmmm … very interesting, very interesting," he mumbled. He shuffled inside and closed the door.



Pretty impressive! When you throw this flyer, it spins.

At first it flies in a straight line. As it slows down, it curves in the direction away from the hand that threw it. It's being held up by the air.

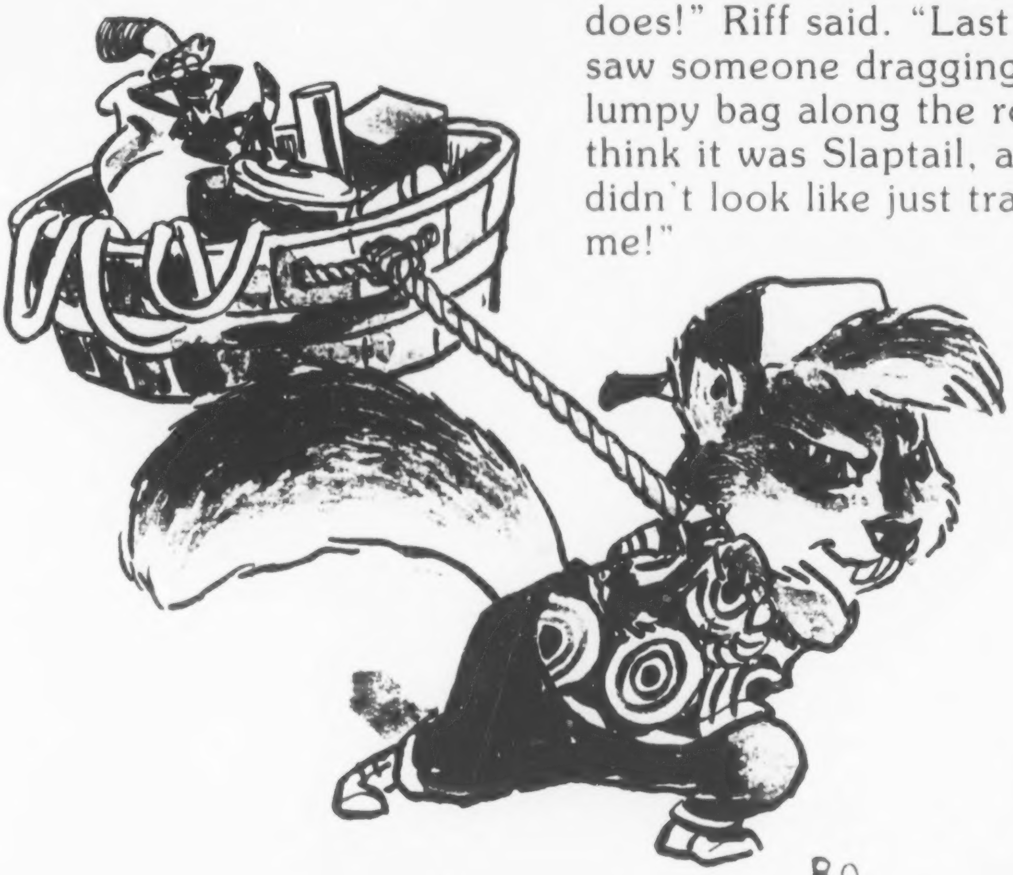
Air carries other things, too. Pollen and seeds from plants are carried by air. Tiny specks of dirt and smoke can float around in the air for a very long time.

Riff showed Rosie how his flyer worked as they left Slaptail's yard. He threw it, watched it fly into an empty lot, and ran to pick it up. There on the ground was a piece of hose and some pipe, and he picked them up, too. Then he found an old washtub. He kept picking up things and putting them in the tub, until it was so heavy that it took all his strength to drag it.

Finally Riff caught up with his cousin and said, "Look at this cool stuff! We can use it to make things."

"You're collecting trash," Rosie replied. "You're as bad as old Slaptail."

"Well, at least I don't sneak around in the dark like he does!" Riff said. "Last night I saw someone dragging a big, lumpy bag along the road. I think it was Slaptail, and it didn't look like just trash to me!"



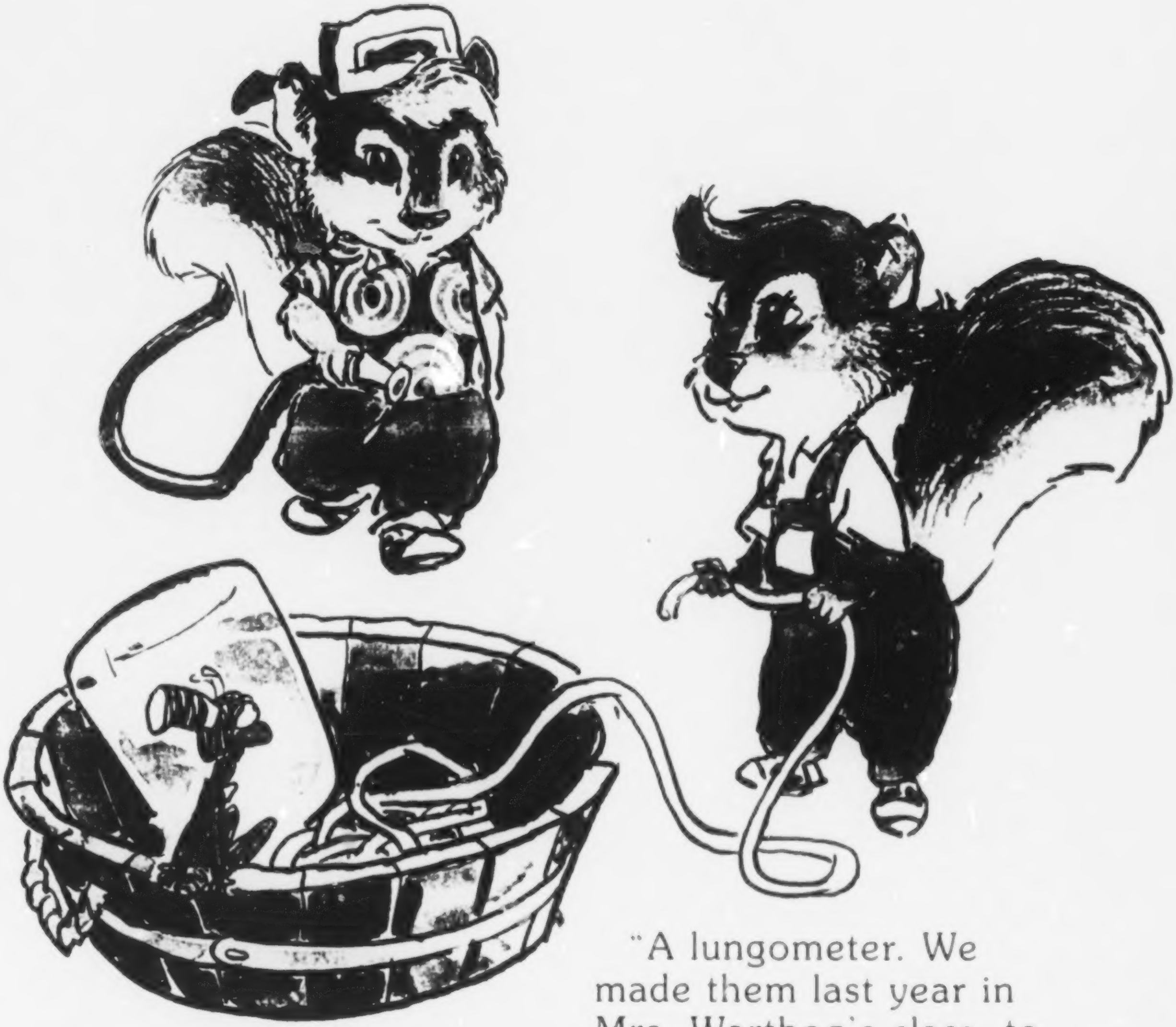
"I told you, Mr. Slaptail is bad news. We're never going back over there!" Rosie warned.

"Well, I want to know what he had in that bag. Besides, I don't think he's so bad," Riff said.

"Yes, he is," Rosie answered. "He's weird! His eyes are all red, and he always smokes that stinky pipe. He lives in a junk pile, and he's an old grouch. Nobody even knows what he does!"

Riff dropped his new junk in Rosie's backyard. "Hey! Some of this stuff is just what you need to make a lungometer," Riff said.

"A what?" Rosie exclaimed.



"A lungometer. We made them last year in Mrs. Warthog's class, to measure how much air we could blow out of our lungs. I could blow the most of anybody in the class," Riff said proudly.

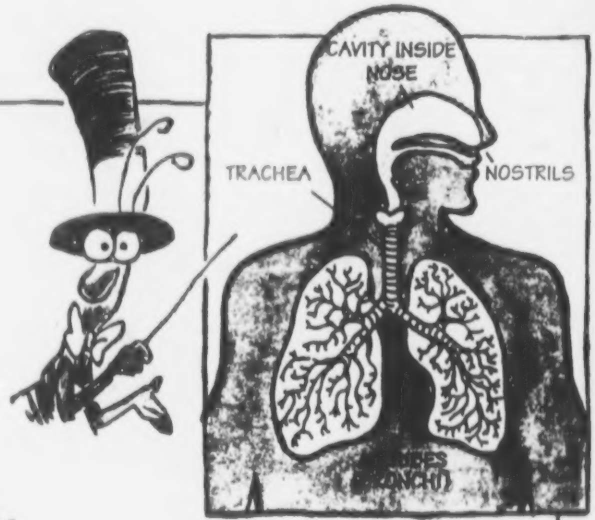
He rummaged through the junk and said, "Here's everything we need – a milk jug, a piece of hose and a big tub."

"See, you fill the tub and the jug with water, and you put one end of the hose into the jug, and you blow on the other end, and …."

"But this stuff is trash," Rosie said. "What a crazy idea!"

"We just need to wash them first," said Riff, "and they'll work fine. The amount of water you force out of the jug shows how much air you can blow out of your lungs. Awesome, huh?"

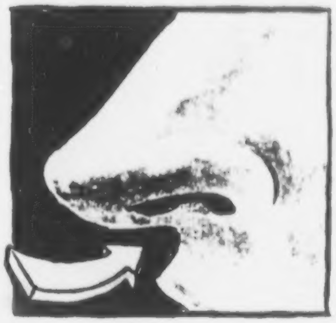
When you breathe in, air is pulled into your lungs. Inside the lungs, oxygen from the air passes into the blood and is sent to cells all around your body. Carbon dioxide is passed back into the air as you breathe out.



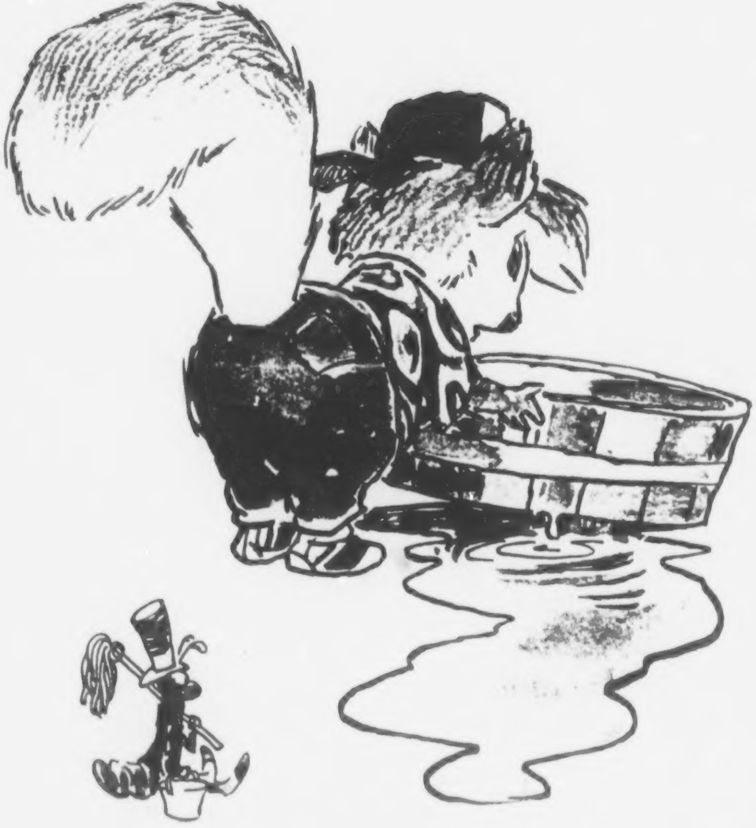
ALVEOLUS (TINY POCKET WITHIN LUNG)

In these tiny pockets, oxygen enters the blood, and carbon dioxide is removed.

Air enters here. The passages inside the nose filter the air.



The amount of air you can blow out is called your vital lung capacity. When you breathe out, some air still is left in your lungs. The total amount of air your lungs can hold (your total lung capacity) can only be measured by doctors in a lab. Sometimes things like smoking or illness can make it hard for a person to blow out much air.



"Yeah, it *would* be awesome if you really could make it work," Rosie answered.

Riff gave her a friendly punch on the shoulder and handed her the jug to wash. He cleaned the piece of hose and began to fill the tub with water. – But out the water came, leaking all around the bottom of the tub and onto the ground.

"Oh, no ...," Riff cried, "this tub won't work!"

"Told you so," Rosie said, smiling. "Awesome – really awesome!"

"Wait a minute," Riff said. "I know – Mr. Slaptail has a washtub. I saw it by his front door. Let's go get it."

"No way!" Rosie answered. "We're not going back. We could get grounded for the summer – or worse!"

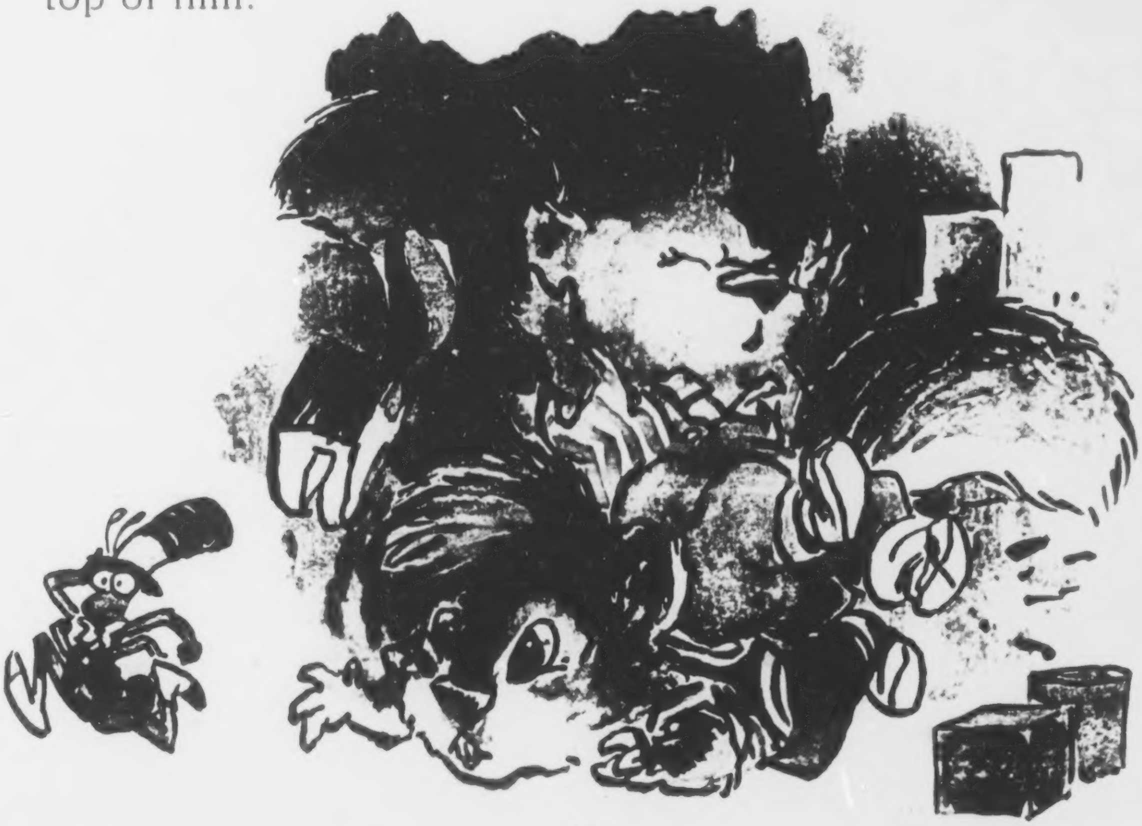
Riff ran toward Mr. Slaptail's house, with Rosie yelling after him. As he dodged around an old tire, Riff's feet suddenly slipped out from under him. He found himself sliding into a deep, dark hole.

He landed at the bottom with a thud. "Help ...," Riff cried.

He heard a voice coming from above. "Riff," it said, "where are you?" It was Rosie.

"I'm down here!" he yelled back. "Watch out for the ..."

"Aaah! ...," Riff cried, as a body landed right on top of him.

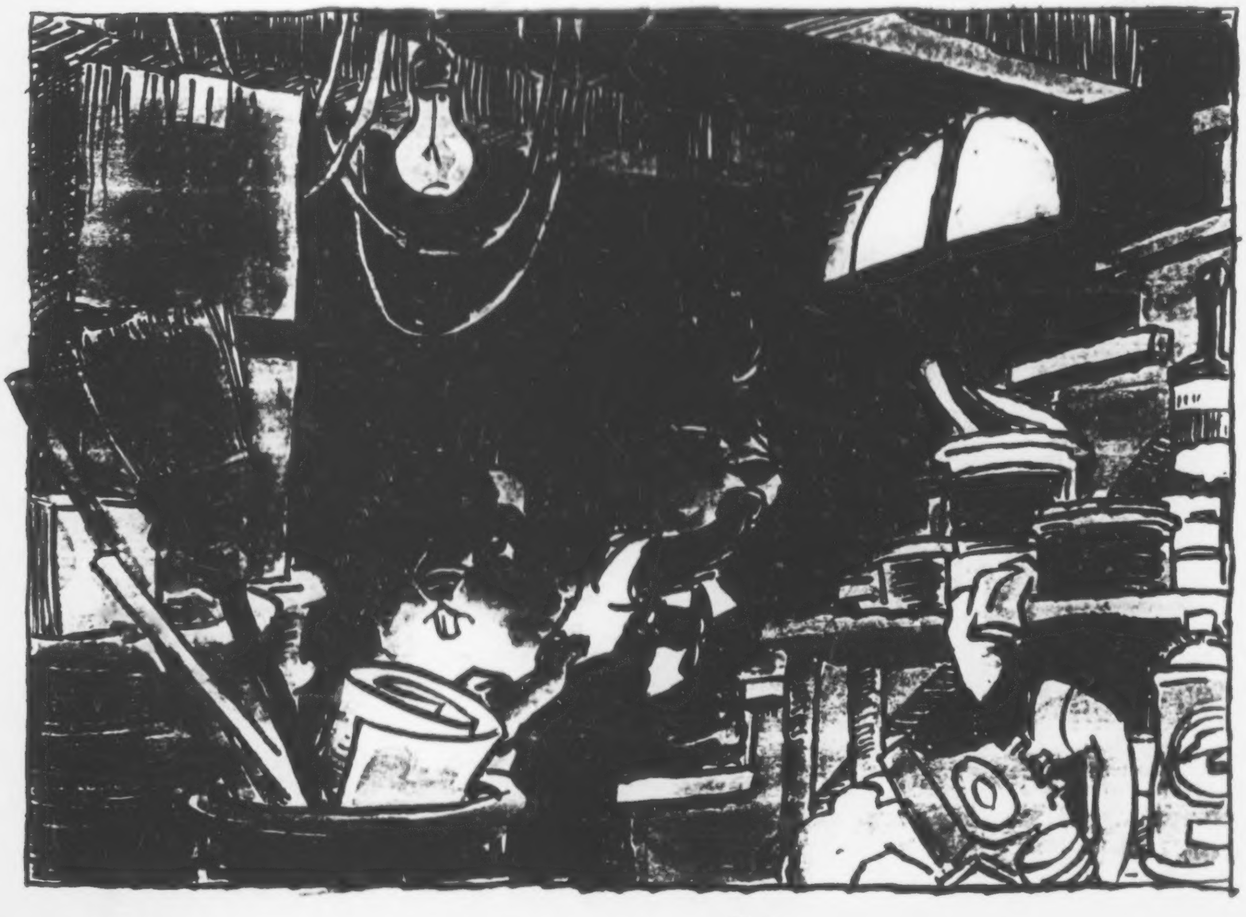


"Rosie? I tried to warn you ...," Riff said in a raspy voice. He couldn't say more. He was coughing too much.

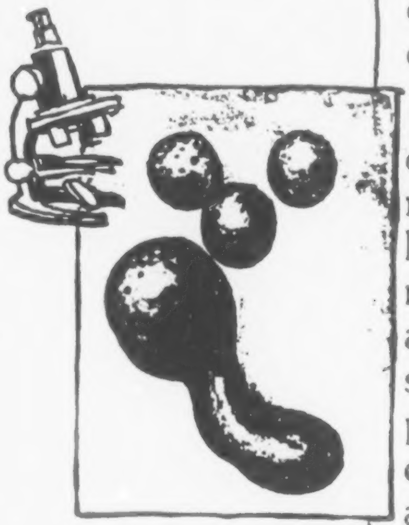
"Where are we? This place is disgusting! It's hard to breathe," Rosie said, and she began coughing too.

"It smells terrible, wherever we are," Riff said. "I can't see much, but it looks like we're in a cellar. It must be old Slaptail's cellar!" Yes, he could smell that same strange mix of odors, only stronger. What was going on in this place?

Rosie started sneezing violently. "Riff, let's get out of here," she snuffled.



This isn't good! Looks like this cellar needs some fresh air! It's stuffy and damp – a great place for molds to grow. Molds spread by producing thousands of tiny spores that float in the air.



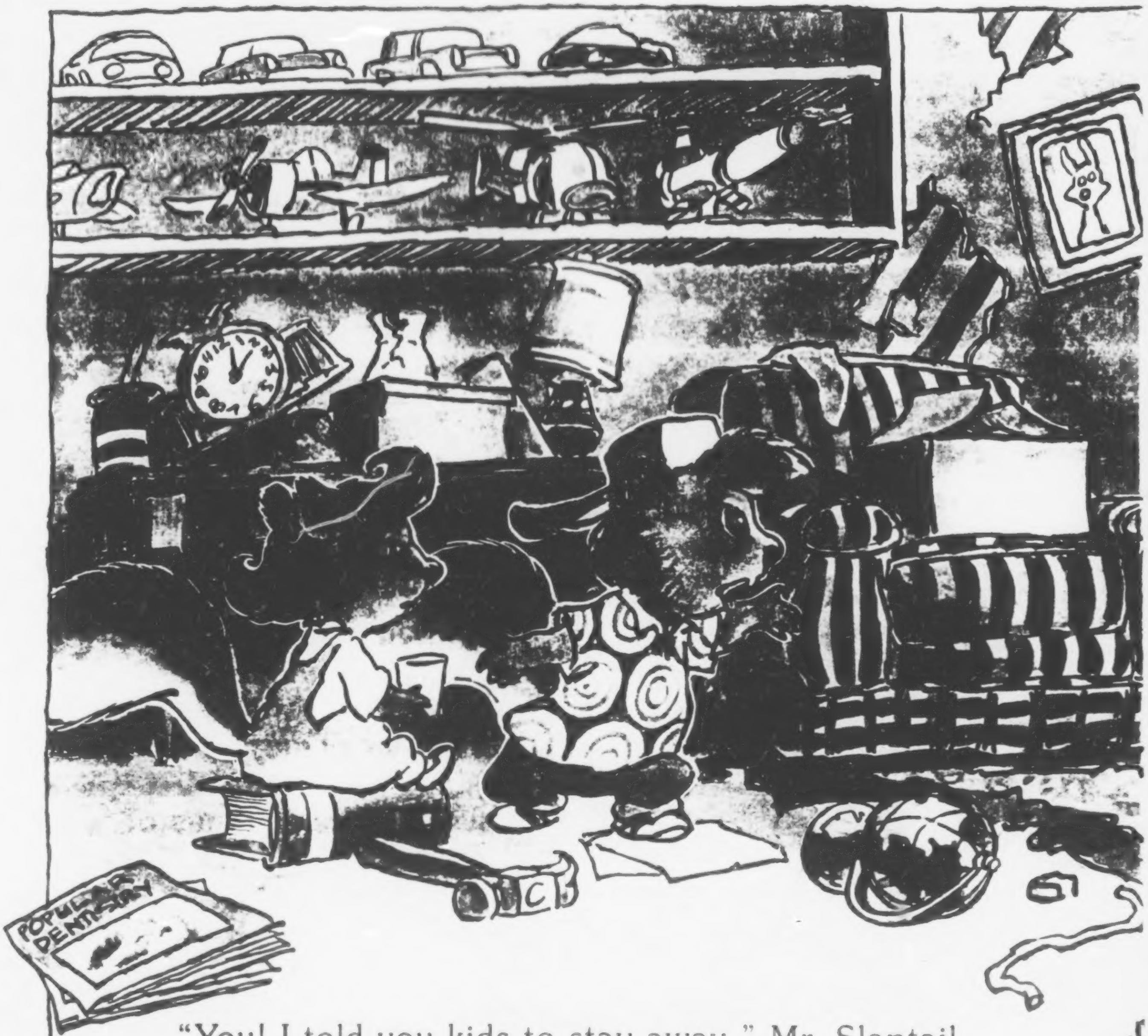
Here's what mold spores look like. Whew! There must be a million mold spores in here – and Rosie is allergic to them!

They looked through the dark room for a way out. As he turned around, Riff spotted some stairs. He started toward them, and suddenly ... CRASH! He tripped over a stack of paint cans.

A door creaked open at the top of the rickety old steps. The light shining downward made strange shapes appear from the shadows. There were piles of stuff everywhere – things of all shapes and sizes, covered with dust and cobwebs.

A voice came from above. There stood old Slaptail, his pipe dangling from his mouth. "What's all the racket? Who's in my cellar?" he snarled.

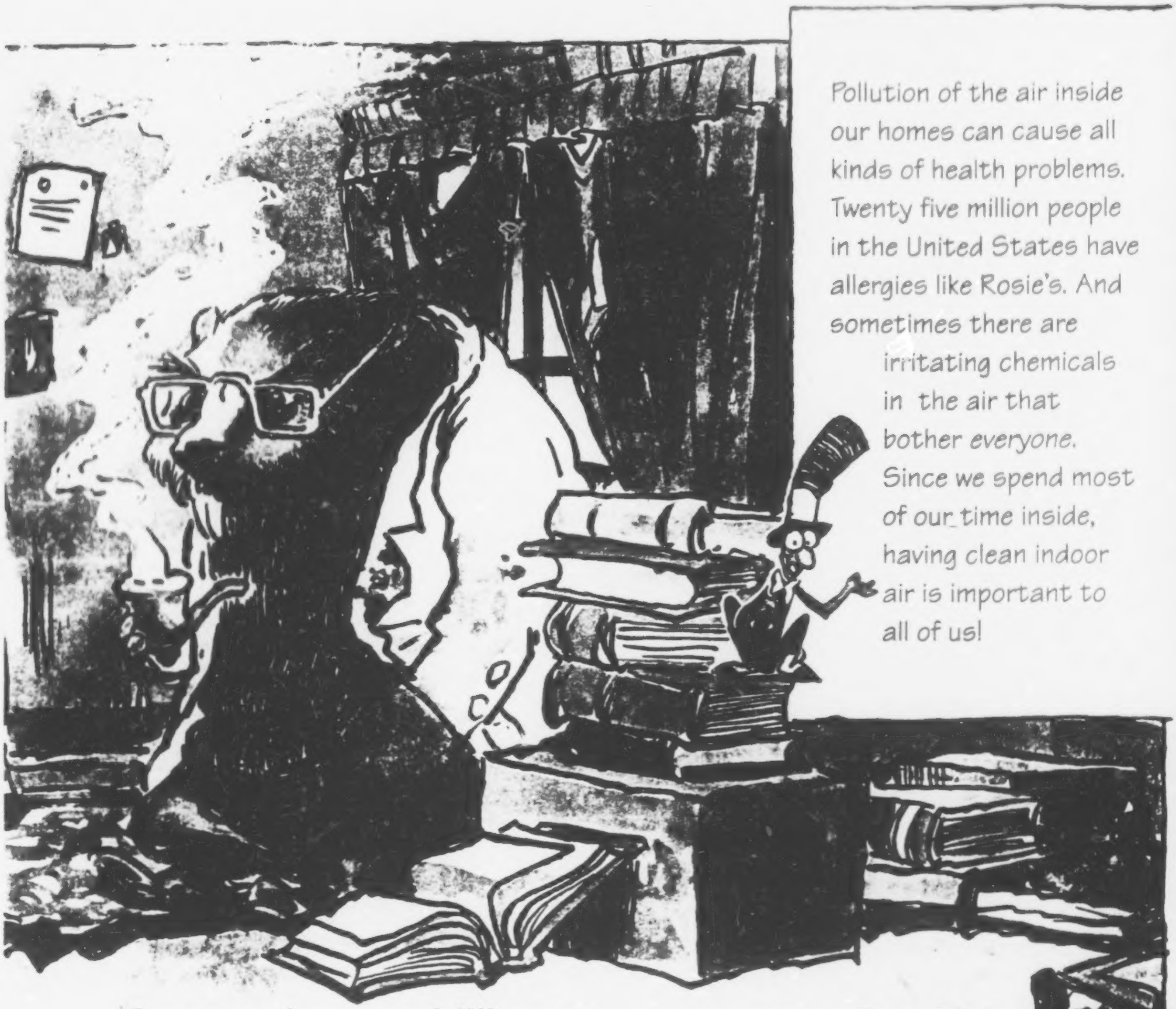
Riff knew they were in double trouble. They had to get out of this polluted cellar, and now Mr. Slaptail thought they were trespassing.



"You! I told you kids to stay away," Mr. Slaptail growled. "What are you doing here?"

Riff didn't answer, but he headed up the stairs. Rosie was coughing and sneezing so hard that she tripped on a step.

Mr. Slaptail's face changed. He looked worried and said, "What happened to you? Are you all right?



Pollution of the air inside our homes can cause all kinds of health problems. Twenty five million people in the United States have allergies like Rosie's. And sometimes there are irritating chemicals in the air that bother *everyone*. Since we spend most of our time inside, having clean indoor air is important to all of us!

Come up here, and I'll get you some water. But then I want an explanation."

While Rosie drank her water, Riff explained how they had come to borrow a washtub and fallen into the cellar.

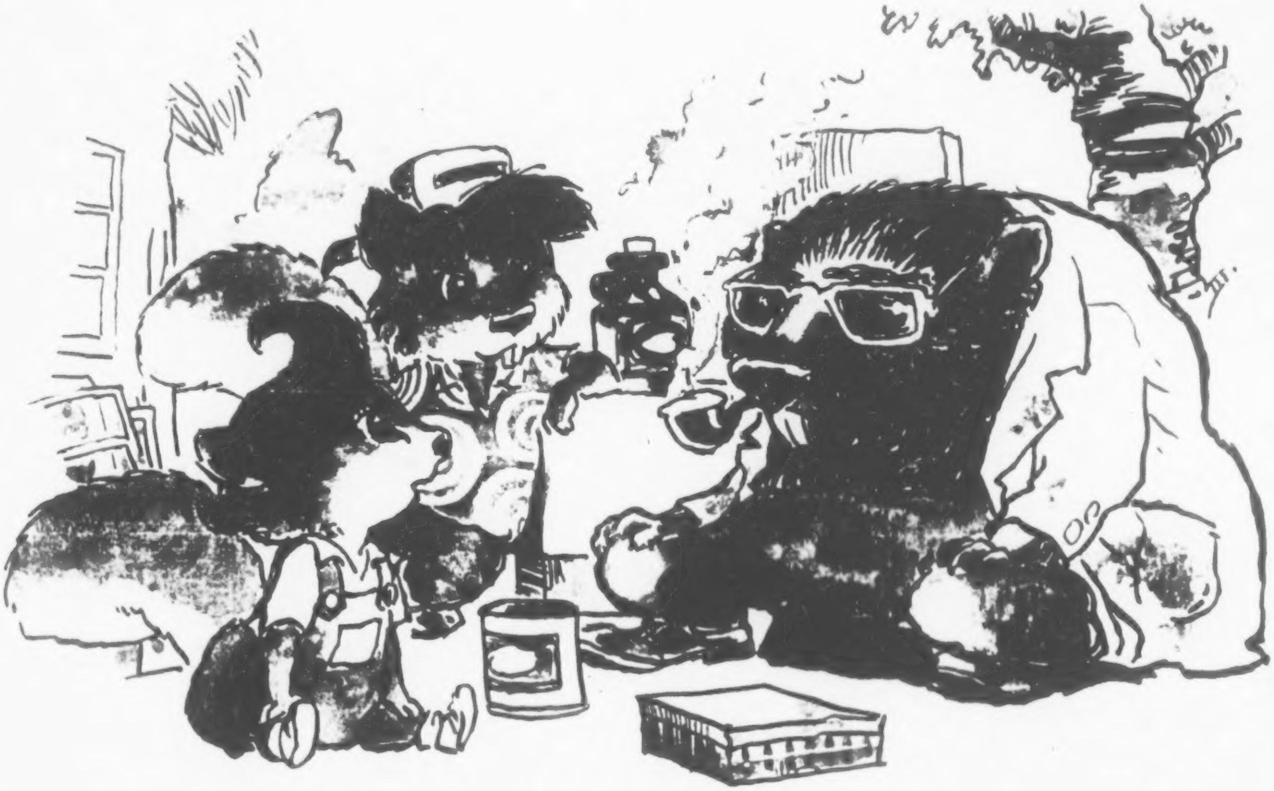
Rosie sneezed again. She rubbed her eyes and wiped her dripping nose. "I think Rosie needs some fresh air," Riff said. "Something in your house is making her feel terrible!"

Riff and Rosie headed out the door. Mr. Slaptail followed.

Rosie said, "Mr. Slaptail, what's wrong with your house? It's so stuffy and smelly! It made me sick."

"Yeah, it made me feel bad too, and I don't even have allergies," Riff added. "Doesn't it make *you* sick?"

"Sick? I'm not sick! I'm just old and tired," Mr. Slaptail said. "I can't see well, I can't hear well, and I can't even breathe very well. That's just the way it is."



Do you know how many air polluters there are in people's homes?

How about:

- cigarette smoke
- household cleaners
- hair spray
- cooking smoke
- pesticides
- dust
- new carpets and paints
- chemicals like paint removers

I'll bet you can even think of some more!

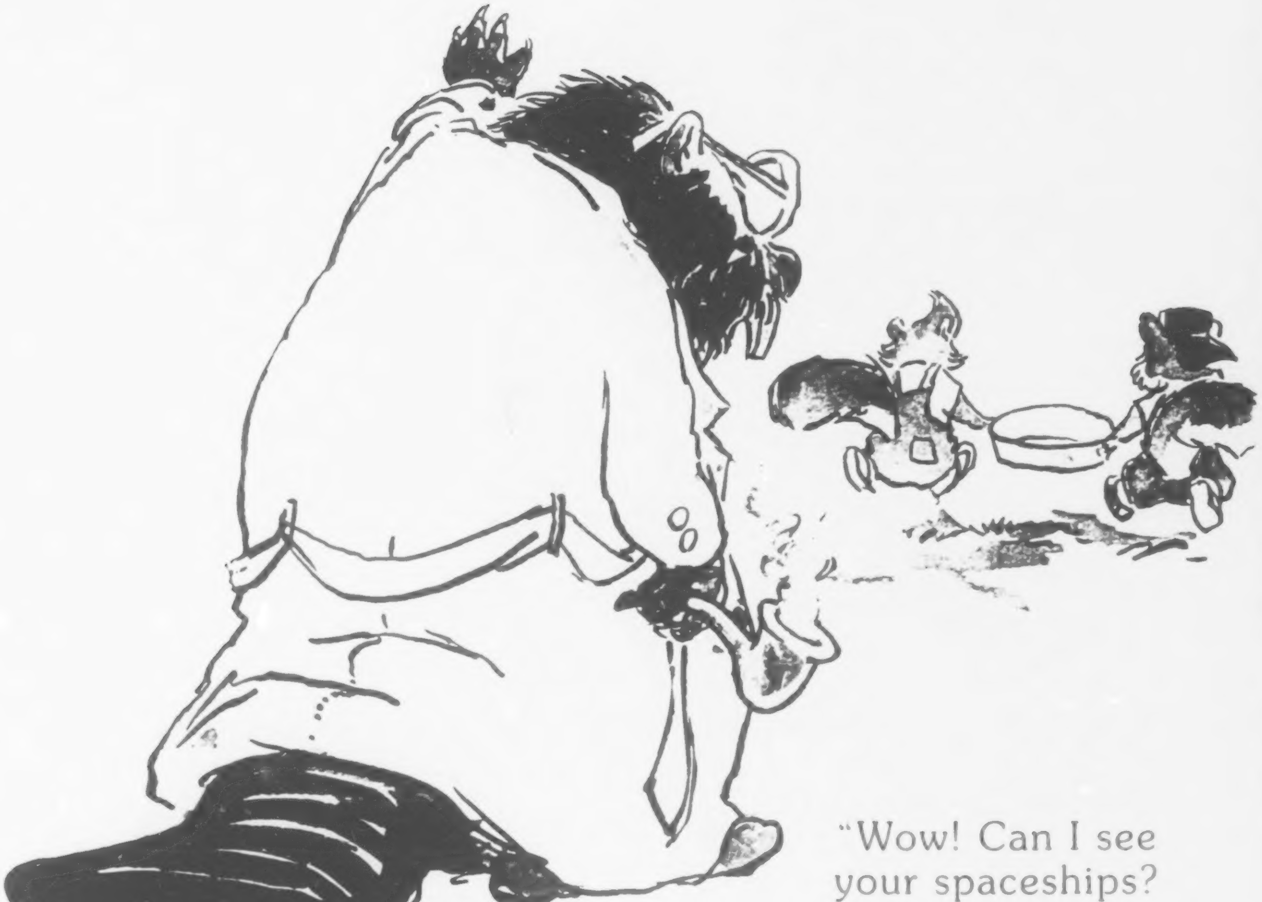
"I don't think it *has* to be that way, Mr. Slaptail," Riff said. "I always thought a little mess wouldn't hurt anybody, but this is unhealthy!"

"This place just needs a little cleaning up, that's all," Rosie said. "What *is* all this, anyway?"

"I collect trash and recycle it to make toys," Mr. Slaptail said. "I use lots of glue and paint, and there's dust everywhere. I guess I haven't cleaned up for a long time. I seem to get out of breath when I ..."

"Toys? What are the toys for?" Riff asked.

"I make model cars and planes and spaceships for children who might not have any toys," Mr. Slaptail answered. "This year, I'm afraid I'm way behind schedule."



"Wow! Can I see your spaceships? I'm going to be an astronaut," said Rosie.

"Right now, you had better get home and take care of yourselves," Mr. Slaptail said. "Here, take the tub you wanted. You're welcome to come back – but use the front door next time!"

Riff got right to work that afternoon, drawing lines on the jug for his lungometer.

Rosie said to him, "I've got to tell my Mom that Mr. Slaptail isn't so mean after all. He sure could use some help, though."

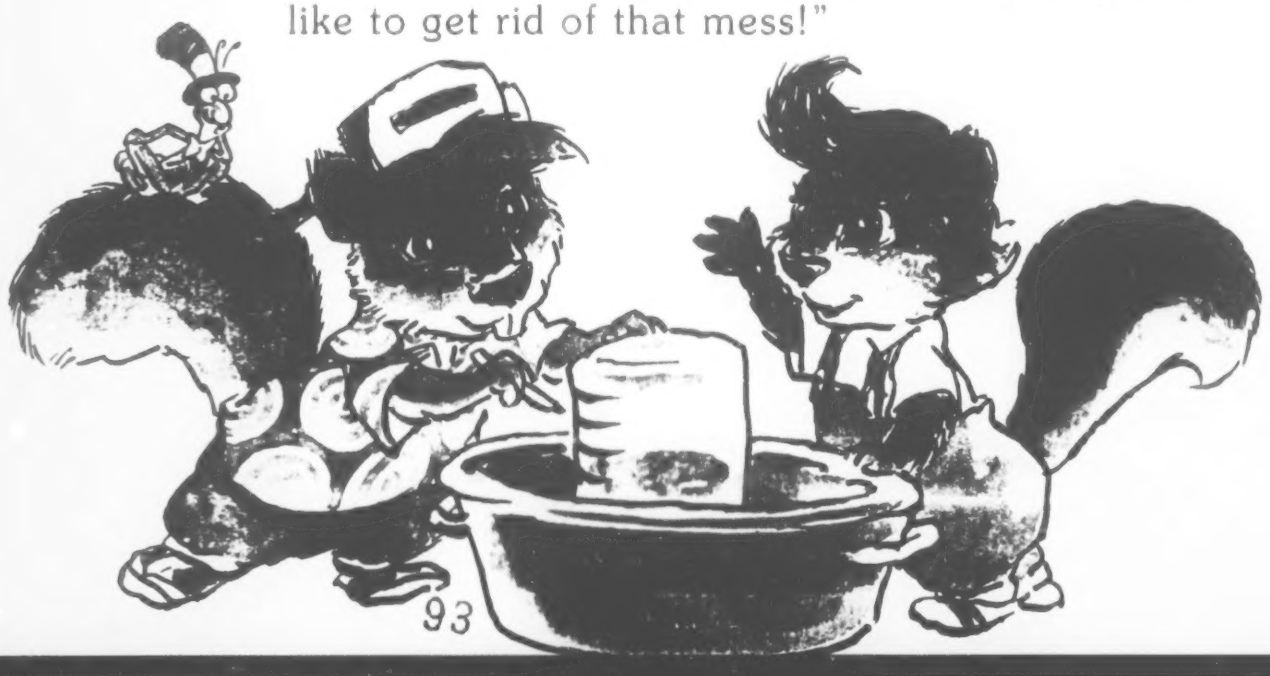
Riff didn't answer.

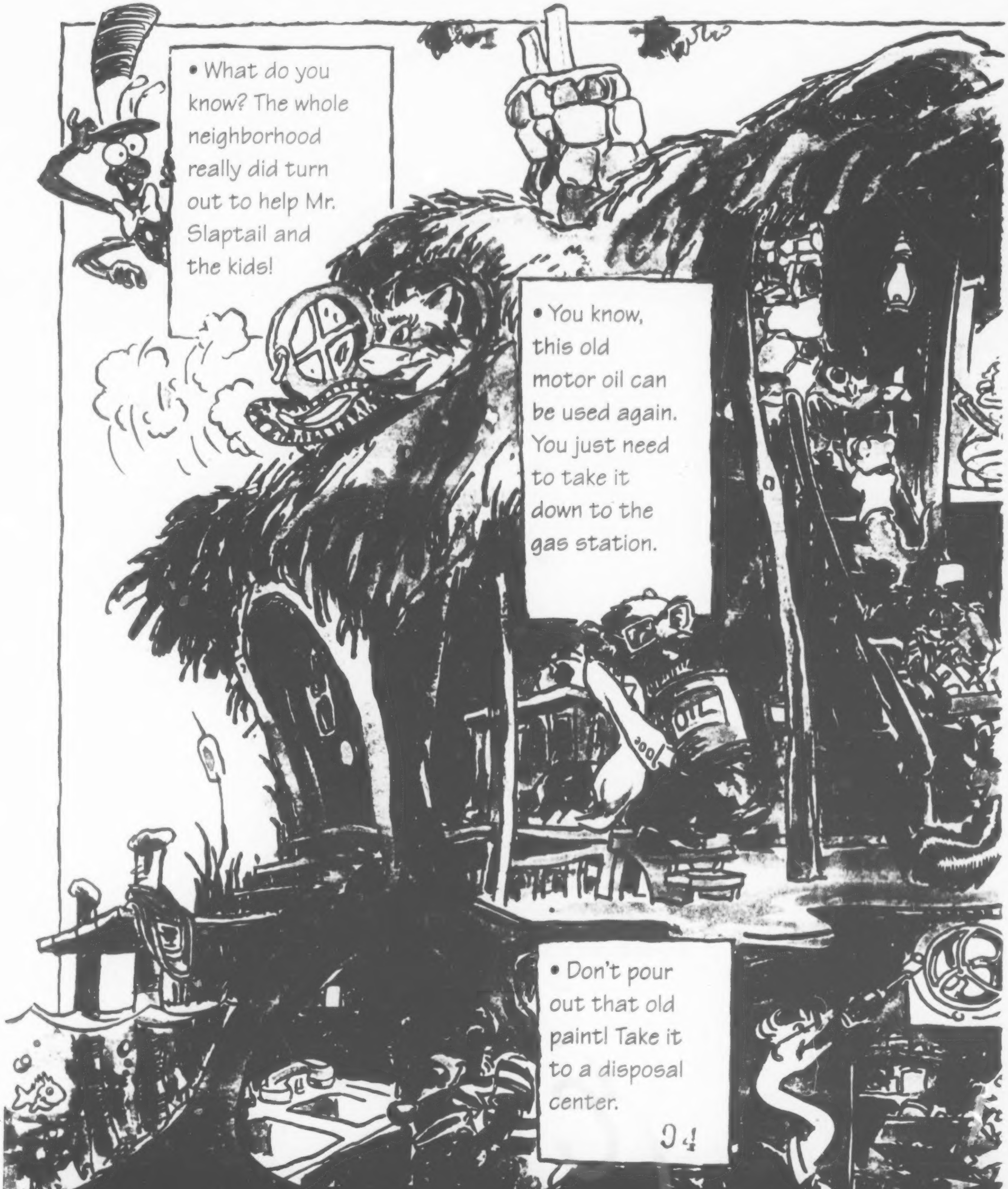
"Riff," Rosie yelled, "can't you think of anything but making stuff? I want to talk about Mr. Slaptail. We should go back and help him clean up. Besides, I want to see his spaceships."

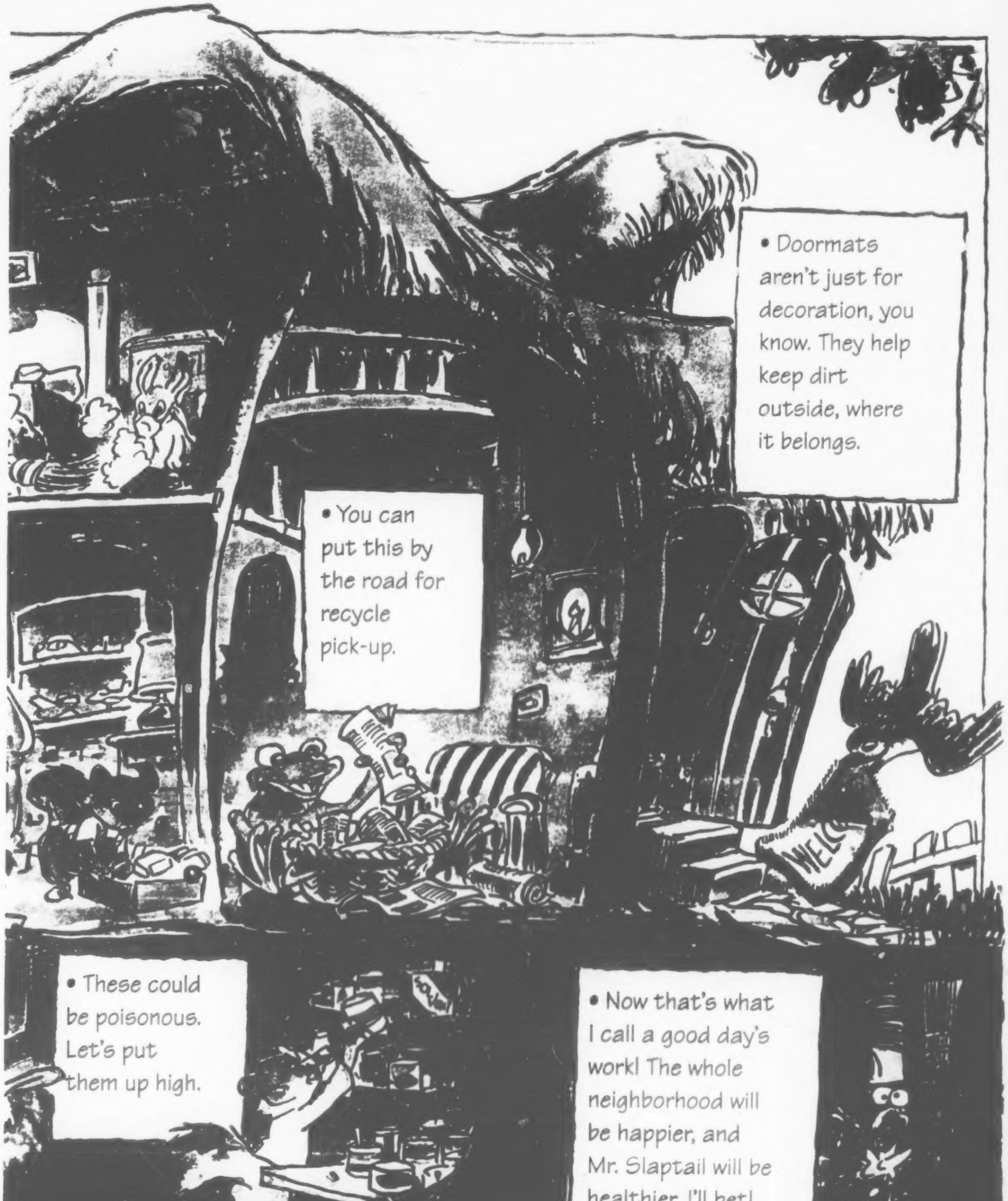
Riff finally paid attention to his cousin. "So do I," he answered, "and maybe we could help him finish those toys."

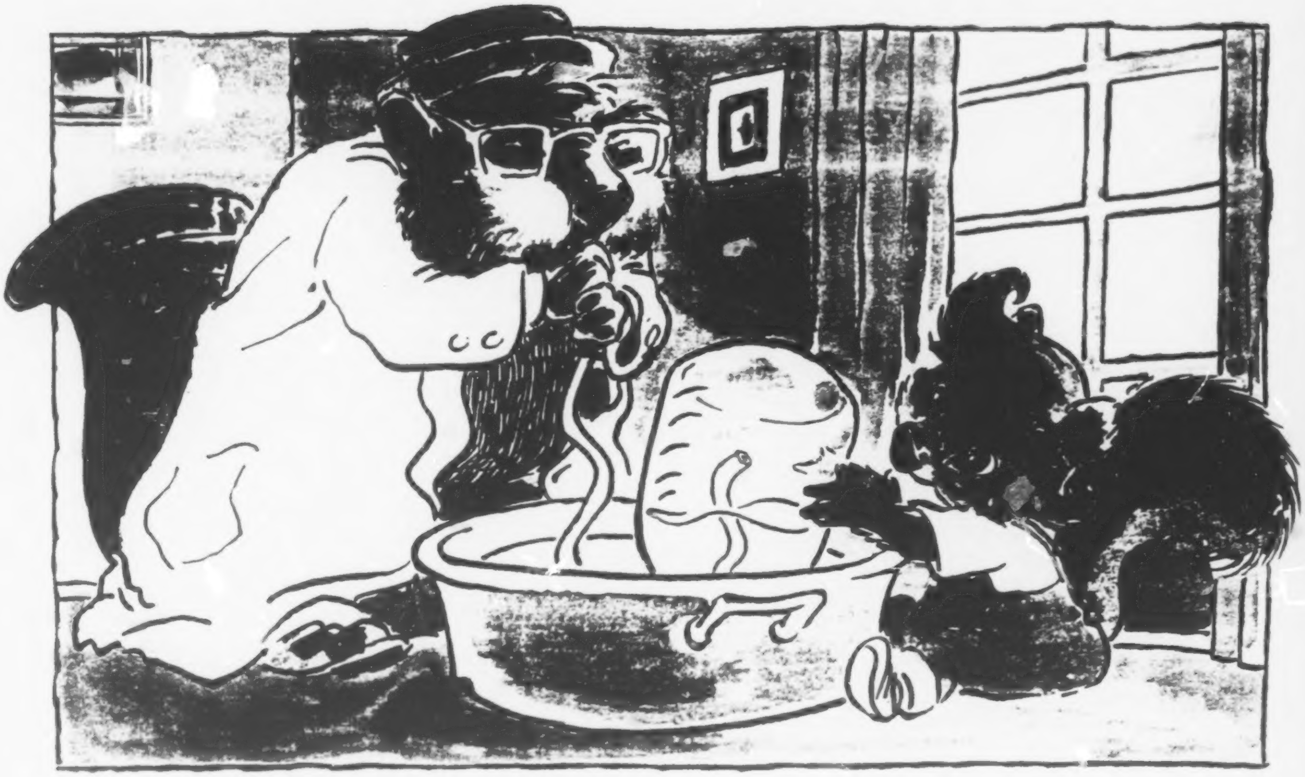
He put down the milk jug and scratched his head. "I'm afraid there's so much to clean up, we can't do it by ourselves," Riff said. "We'll need help. Hey – do you think your neighbors would pitch in?"

"I bet they'd do it," Rosie replied. Everybody would like to get rid of that mess!"




• What do you know? The whole neighborhood really did turn out to help Mr. Slaptail and the kids!
• You know, this old motor oil can be used again. You just need to take it down to the gas station.
OIL
• Don't pour out that old paint! Take it to a disposal center.


• Doormats aren't just for decoration, you know. They help keep dirt outside, where it belongs.
• You can put this by the road for recycle pick-up.
• These could be poisonous. Let's put them up high.
• Now that's what I call a good day's work! The whole neighborhood will be happier, and Mr. Slaptail will be healthier, I'll bet!



All through the summer, Riff and Rosie went to make toys with Mr. Slaptail. He had stopped smoking his old pipe, and the air in his house didn't bother them any more. Mr. Slaptail didn't cough or wheeze so much. He even stood straighter and moved faster than before.

"Here, Rosie, hold the jug upright while Mr. Slaptail blows," Riff said. "I want to finish these flyers before I leave for home."

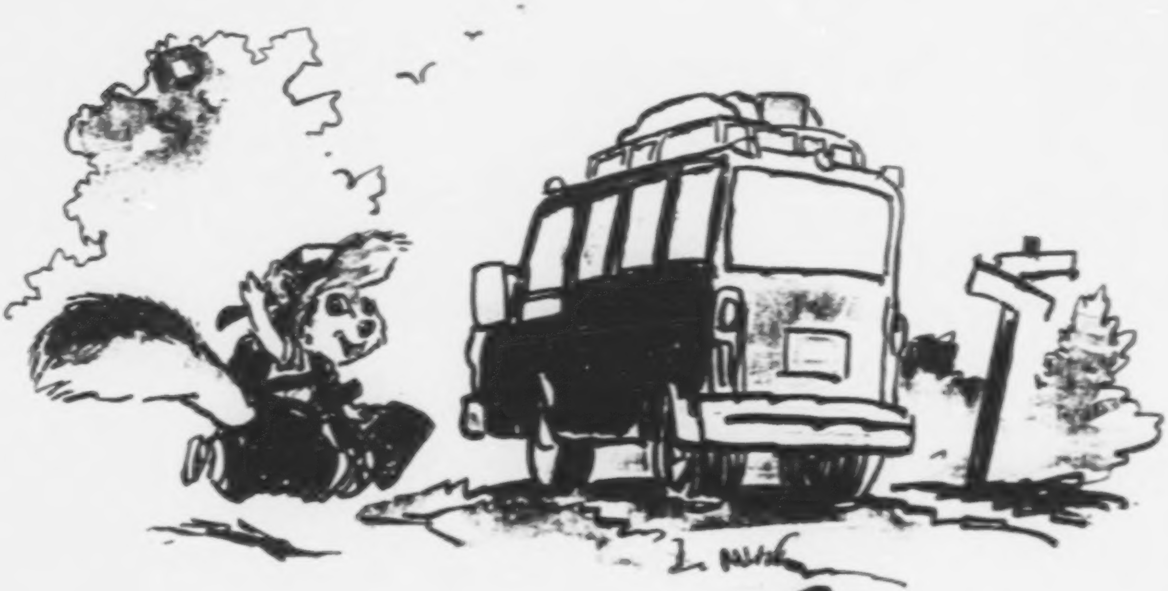
The old man took a deep breath and blew hard into the hose. "This lungometer of yours is great!" he said. "Just look at how much I blew out this time!"

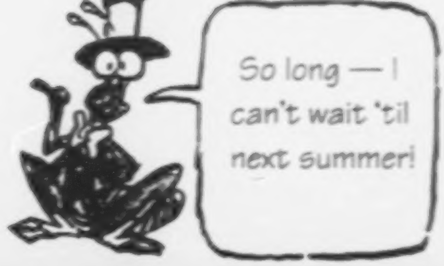
Riff was still painting a flyer when Rosie picked up Riff's bags and hollered, "Come on – your bus is here!"

"Bye ...," Riff called as he dropped his brush and ran for the door.

"Whoa," said Mr. Slaptail, grabbing Riff by the sleeve. "Slow down, son. I want to thank you for your help this summer. Here – take this plane along to remind you to come back."

"Wow! Thanks!" Riff exclaimed, tucking the model plane under his arm. "I'll be back. Rosie and I are making a *big* spaceship next year!"




So long — I can't wait 'til next summer!

GLOSSARY

allergy *(AL-ur-jee)* - A bad reaction to something such as a food, an animal's fur, or a chemical. Someone with an allergy might have trouble breathing, start sneezing or get a rash; **allergic** *(al-UR-jik)* - Having an allergy.

alveolus *(al-VEE-uh-luhs)* - A tiny pocket in the lungs where oxygen enters the bloodstream and carbon dioxide leaves the bloodstream.

carbon dioxide *(KAHR-buhn dy-AHK-syd)* - A gas made up of carbon and oxygen. You cannot see or smell it. It is given off when living things breathe and when things burn or decay.

dust mite *(DUHST myt)* - A microscopic animal that eats tiny flakes of skin and other things in dust. Mites are related to ticks and spiders.

lungs *(luhngz)* - Two spongy, bag-like organs located in the chest of humans and many other animals with backbones. During breathing, the lungs take in air, absorb oxygen and give off carbon dioxide.

lung capacity *(LUHNG kuh-PAS-uh-tee)* - The largest amount or volume of air held by the lungs. **Vital** *(VY tuhl)* **lung capacity** is the amount of air a person is able to blow out. **Total lung capacity** includes air that remains in the lungs after a person breathes or blows air out.

mold *(mold)* - A fuzzy growth on damp or rotting surfaces. Relatives of molds include mushrooms, yeasts and toadstools.

oxygen *(AHK-sih-juhn)* - An invisible, odorless gas that is needed by almost all living things. During breathing, air is taken into the lungs and oxygen is absorbed into the bloodstream. Oxygen also is needed to make things burn.

pesticide *(PEHS-tuh-syd)* - A chemical used to kill pests, especially weeds and unwanted insects.

poison *(POY-zuhn)* - A harmful substance that causes sickness or death when swallowed, breathed or absorbed through the skin; **poisonous** *(POY-zuhn-uhs)* - Containing poison.

pollen *(PAHL-uhn)* - Tiny grains, made by flowering or cone-bearing plants, that are needed to produce seeds. They are carried to other plants by wind, water, and animals such as insects.

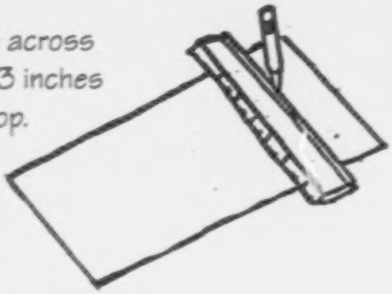
pollute *(puh-LOOT)* - To spoil the air, water or soil by adding harmful substances.

spore *(spor)* - A tiny cell that can grow into a new individual. Spores are produced by some bacteria, fungi, algae (seaweed and its relatives), and nonflowering plants.

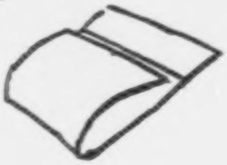
How To Make A Paper Flyer*

Materials: 8 1/2 X 11 inch piece of paper, ruler, pencil, marker and tape

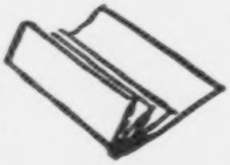
1. Draw a line across the paper, 3 inches from the top.



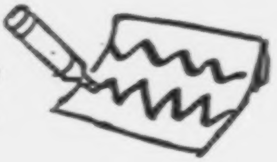
2. Fold the bottom edge of the paper up to the line, and crease on the fold.



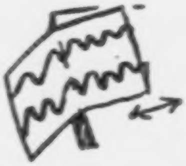
3. Fold the bottom edge of the paper up to the line two more times, creasing carefully each time. You should have a thick, folded band of paper about 1 inch wide.



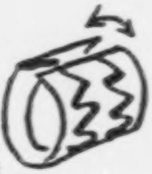
4. Decorate the side opposite the folded band.



5. Hold the paper by the ends of the band with the folded sides down, and carefully rub the band across the edge of a table several times to curve it.



6. Bring the two ends of the paper together and gently slide one end into the other to form a cylinder. Tape the resulting seam together.



7. To sail your flyer, hold it between your thumb and fingers with the band facing forward. Throw it overhand, like a football.

* With adult help, flyers may be made from cans that have a metal rim on one end (e.g., soft drinks, tennis balls, potato chips). Use a can opener or scissors to remove both ends of the can, leaving the top rim in place. Smooth any sharp edges with sandpaper or cover them with masking tape. Throw overhand with the rim facing forward.

Adapted from **Flight Curriculum**,
National Aeronautics and Space Administration (NASA)

The authors of this story – Judith Dresden, Barbara Tharp and Nancy Moreno – are faculty members of the Division of School-Based Programs at Baylor College of Medicine in Houston, Texas. They have been working together at Baylor for several years on science education projects involving teachers and students from kindergarten through college. All are parents of teenage or grown children. As a team, they also created instructional materials for the *BrainLink*℠ project, which served as a model for My Health My World.

- Judith Dresden, originally from New York and New England, formerly did educational research and evaluation for public and private schools. Editorial work with a publishing company also led to her current interest in writing and editing stories and science activities for children. Other projects involve promoting minority students' access to careers in science and medicine.
- Barbara Tharp, originally from California, once worked for the FBI in Washington, D.C., and later was an economic analyst for an oil company. More recently, she has been an elementary teacher specializing in her favorite subjects, science and math. Currently, in addition to creating educational materials, she also enjoys working with many classroom teachers.
- Nancy Moreno, originally from Wisconsin and Michigan, is a biologist who specializes in botany. She spent considerable time studying neotropical plants in Mexico before completing her doctoral degree at Rice University. Her current interests include involving scientists in the education of elementary students and teachers.

The illustrator, T Lewis, was born in Texas but has traveled extensively, living in such locales as Africa, Switzerland and Alaska. Currently, he "commutes" between Houston, Texas and a small town in the state of Washington where he and his wife are raising their young son.

While his broad range of professional artwork has appeared in many formats, T Lewis is especially fond of creating illustrations for children. Recent books bearing his work are *Bedtime Rhymes from Around the World and Cinderella: The Untold Story*. Currently, he also draws the Mickey Mouse comic strip for Disney Productions, as well as other comic features for national syndication.

WOW!™
publications

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My Health My World® Adventures
Developed by
Baylor College of Medicine
Houston, Texas
ISBN 1-888997-10-3

MY HEALTH MY WORLD
MY WORLD INDOORS

THE READING LINK

Reading activities to use with

MR. SLAPTAIL'S SECRET

RIFF AND ROSIE

MY HEALTH MY WORLD

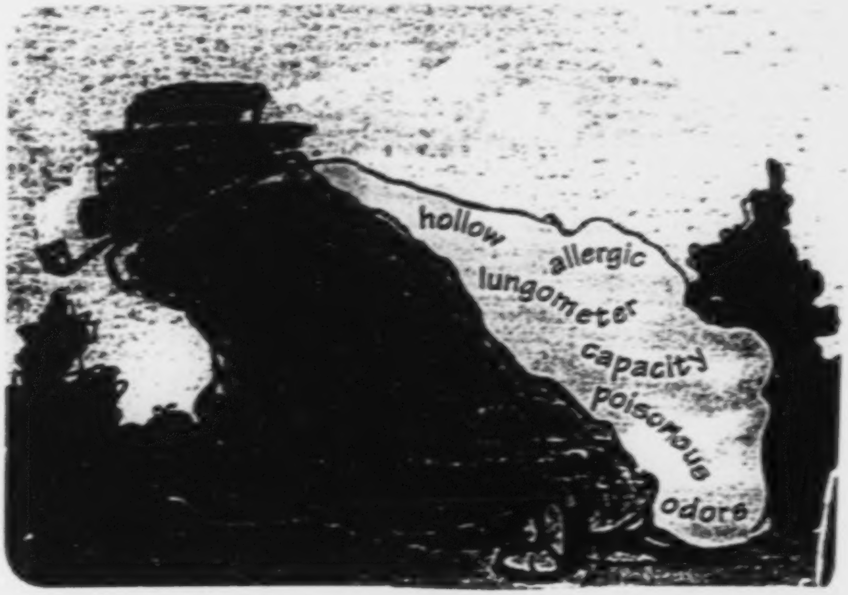
MY WORLD INDOORS

The Reading Links have been created as ready-to-use reading and writing activities that are directly related to My Health My World adventure stories. They are not intended to represent a comprehensive reading program. The activities are related to reading objectives common to many curricula and covering a range of grade and ability levels. Teachers may wish to select from these activities those that are most appropriate for their own students.

Prepared by
Baylor College of Medicine
Houston, Texas
2000

Word Meaning/Context Clues

A. **Bag of Words.** Find the word in the bag that fits best in each blank space. Write the correct words in the blanks.



1. Rosie sneezed when the curtains became dusty. She was ____________ to dust.

2. The smell of smoke, paint and other ____________________ were irritating to her nose.

3. When Mr. Slaptail used Riff's __________________, he found out that his lungs could hold more air.

4. Some chemicals are so _________________ to human beings that they can make you sick, or even kill you.

5. Riff's flyer was an empty tin can that looked like a ______________ tube with no ends.

6. How much air can your lungs hold? I bet my lung ________________ is larger than yours!

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B. **Mixing Words.** A compound word combines two other words. For example, **space + ship = spaceship.**

1. What words can you make by combining another word with **space**? What other compound words can you make using the word **ship**?

Words with space	Words with ship

2. Here are some more compound words used in *Mr. Slaptail's Secret*: **moonlight, sleepyhead, earthquake, somebody, nobody, something.**

Take these words apart, and make new compound words by combining some of the single words with other words. For example, **something = some + thing. Some + where = somewhere. Any + thing = anything.** What new words can you make?

C. **Many Meanings.** Sometimes a word can have more than one meaning. Look at the different meanings for **trip** and **spot**. Then pick the meaning of those words that fits best in each sentence. Write its number next to the sentence.

trip
1. a journey from one place to another
2. to catch your foot on something and stumble or fall
3. to cause someone to stumble
4. to move lightly with quick steps; to skip

_____ Watch your step so you won't trip over that rope!

_____ Riff had a fine trip on the bus.

_____ I didn't mean to trip you with my foot.

_____ Riff watched Rosie trip across the field to Mr. Slaptail's house.

spot
1. a small mark or stain
2. a place or location
3. to mark with spots
4. to find or locate

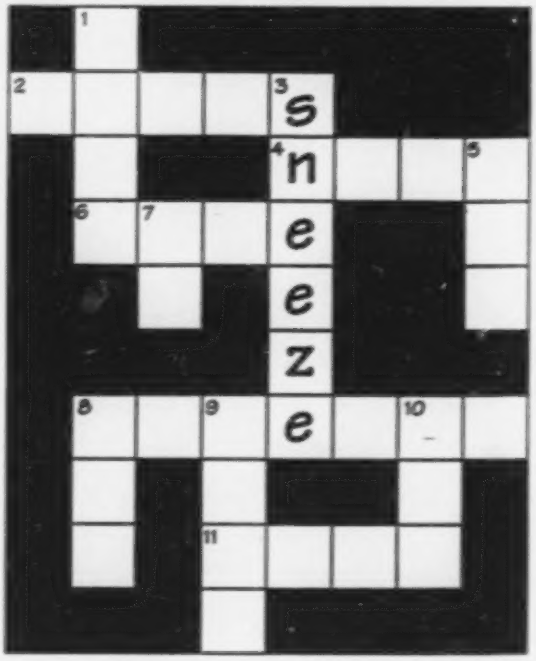
_____ It was too dark for Riff to spot his flyer.

_____ This is the spot where they found the old tub.

_____ Rosie saw a dirty spot on Mr. Slaptail's coat.

_____ Riff will spot the flyer he is making with red dots.

D. **Mr. Slaptail's Secret Crossword Puzzle.** All of the words in this crossword puzzle are in the story, *Mr. Slaptail's Secret.*



Across

2. Organs in the chest that take in air during breathing
4. Riff will be back ____________ summer.
6. Rubber wheel covering that is filled with air
8. A bad reaction to something in the air or something you eat
11. Riff's ___________ slipped out from under him, and he fell.

Down

1. Tiny, dry, powdery particles in the air
3. To force air through the nose and mouth with a sudden, violent burst
5. A low, round container for liquids or solids
7. The opposite of out
8. What we breathe in and out of our lungs
9. The direction in which Riff's flyer turned
10. To go for and bring back

Sequence of Events

A. Read pages 10 and 11 in *Mr. Slaptail's Secret.* Which one of the three things below happened FIRST? Write 1 next to it. Then write 2 by the event that happened next, and 3 by the one that happened last.

_____ Riff and Rosie smelled smoke and paint when a door opened.

_____ The old man told Riff and Rosie to get off his property.

_____ Riff found his flyer in a pile of junk.

B. After you have read the whole story, find which event below happened LAST. Write 4 next to it. Then write the numbers 1, 2 and 3 to show the order in which the other events happened.

_____ Riff and Rosie landed in Mr. Slaptail's cellar.

_____ Mr. Slaptail gave Riff a toy airplane to take home with him.

_____ Riff saw someone dragging a big, lumpy bag along the road.

_____ All the neighbors helped clean up Mr. Slaptail's house.

Cause and Effect Relationships

Read pages 20 and 21. Then write your answers to these questions:

Why did Rosie start sneezing?

Why could Riff and Rosie suddenly see strange shapes in the shadows?

Why did Mr. Slaptail come to the door at the top of his cellar stairs?

Why did Riff think they were in double trouble?

Details and Supporting Ideas

A. Look at the picture on page 2. In your own words, write down what you see. Tell who, where and what. Include as many details as you can.

B. When Riff and Rosie went to Mr. Slaptail's house, they saw many things that needed to be changed or cleaned up. Name as many things as you can about Mr. Slaptail and his home that were unhealthy.

C. Think about the three main characters in the story. Choose which one is your favorite. Tell why you like that character the best, giving as many reasons as you can.

My favorite character in the story, *Mr. Slaptail's Secret* is_______________.

That is because

____

____

____

____

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____

Main Idea

A. **Choosing the Main Idea.** Look at the yellow box on page 7. Which sentence below best tells the main idea of this Grasshopper's Science Box? Fill in the circle by your answer.

○ That sun is bright!
○ Dust is everywhere.
○ This little critter is a dust mite.
○ The one with spikes is a pollen grain from a flower.

Look at the yellow box on page 23. Which sentence below best tells the main idea? Fill in the circle by your answer.

○ Pollution of the air inside our homes can cause health problems.
○ Twenty five million people in the U. S. have allergies.
○ Sometimes there are chemicals in the air that bother everyone.
○ Since we spend most of our time inside, clean indoor air is important.

B. What do you think is the main idea of the story, *Mr. Slaptail's Secret*? Write it, in your own words, in the space below.

Summarizing

A. After you have read *Mr. Slaptail's Secret*, list 5 things that people can do to keep the air in their homes clean so they will stay healthy.

1. ______________________________

2. ______________________________

3. ______________________________

4. ______________________________

5. ______________________________

B. How were Riff and Rosie able to help Mr. Slaptail and the neighborhood?

____

____

____

____

C. Pretend you are Riff, visiting your cousin Rosie. Write a short note to your family at home, telling them about Mr. Slaptail. What problems did he have? What was his secret?

____

____

____

____

____

____

____

Fact and Opinion

Facts are true. Opinions are what someone thinks, but they might not be true. Tell whether you think each of these sentences from the story states a fact or an opinion. Write **F** or **O** in each space. (Look back in the story if you need to.)

_____ Rosie is allergic to Riff. (pg. 2)

_____ Riff's old tin can isn't worth caring about. (pg. 4)

_____ The yard around Mr. Slaptail's house looks like a junk yard. (pg. 8)

_____ Mr. Slaptail's yard is a gold mine. (pg. 10)

_____ Riff and Rosie were trying to trick Mr. Slaptail with the flyer. (pg. 12)

_____ Riff's flyer really does fly. (pg. 13)

_____ Riff and Rosie are trespassing inside Mr. Slaptail's house. (pg. 21)

_____ Something in Mr. Slaptail's house is making Rosie feel sick. (pg. 24)

_____ Mr. Slaptail is not sick, just old and tired. (pg. 24)

Inferences/Generalizations and Conclusions

A. Fill in the circle by the word that best answers each question.

1. How did Riff feel when he saw something outside the window in the moonlight and said, "What's that guy dragging . . . ? He sure looks creepy!"?
   - ○ afraid
   - ○ friendly
   - ○ happy
   - ○ angry

2. How do you think Riff felt when he said to Mr. Slaptail, "I collect stuff too. Do you make things with it?"?
   - ○ afraid
   - ○ friendly
   - ○ sad
   - ○ angry

3. How did Mr. Slaptail feel when he said, "This lungometer of yours is great! Just look at how much I blew out this time!"?
   - ○ happy
   - ○ angry
   - ○ sad
   - ○ afraid

B. Think of all the reasons Mr. Slaptail might have had to make toys for needy children. Write a list of possible reasons:

1. ______________________________

2. ______________________________

3. ______________________________

4. ______________________________

5. ______________________________

6. ______________________________

Following Written Directions

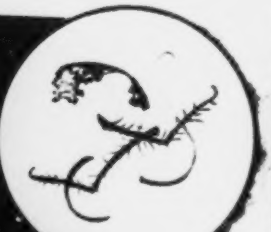
Follow the directions on page 35 to make a paper flyer. Work with a partner to make a flyer together the first time, and then make and decorate your own flying cylinder.

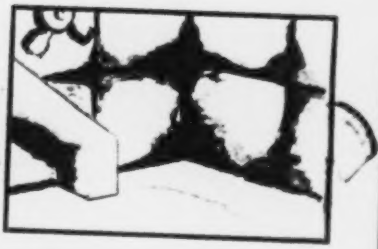
MY HEALTH MY WORLD
MY WORLD INDOORS

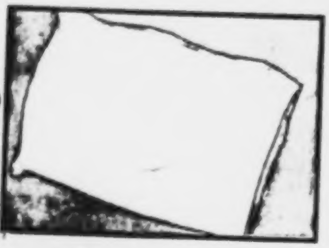
EXPLORATIONS

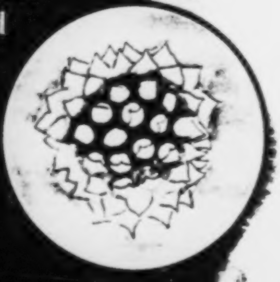
FOR CHILDREN AND ADULTS

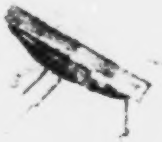
These are things in dust. Can you guess where each comes from? Draw a line from each magnified piece of dust to the box you think it came from.

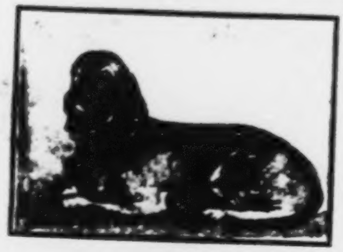


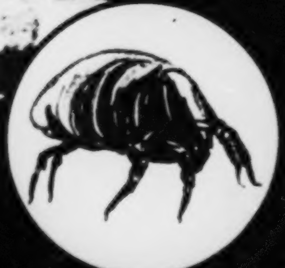


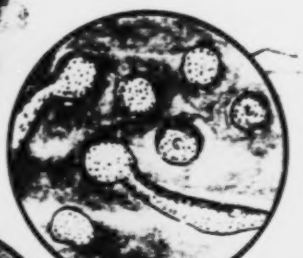


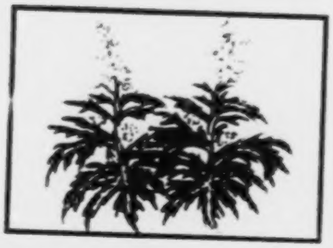


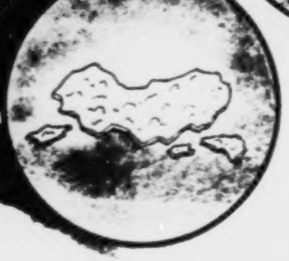


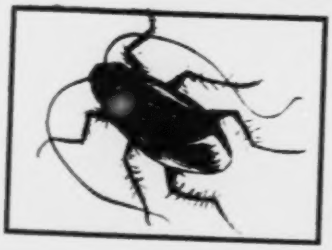












Turn to page 3 to find out.

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Let's Talk about... Ind

When we talk about air pollution, we often think of smog, chemicals produced by factories or exhaust from cars. These are problems that usually affect the air outdoors. But most of us spend much of our lives inside buildings. We go to school or work indoors. We eat our meals, do our homework, play and sleep indoors. All of that time, we breathe air that is in the room.

Indoor air can become polluted, or spoiled, by adding harmful things to it, just as outside air can. For example, household cleaners, dust, paints, bug sprays, smoke from cooking or cigarettes, and fibers from some building materials all can make indoor air unhealthy to breathe. We often need to keep doors and windows closed to keep the insides of our buildings cool in the summer or warm in the winter. This can trap pollutants inside for a long time. It also can make places for insects, dust mites and molds to live.

Some pollutants of indoor air are so irritating that they can bother anyone who breathes them. These include paints, asbestos fibers, smoke, cleaners, insect sprays and chemicals used on fabrics.

Other polluters can cause more problems for some people than for others. For example, some people are allergic to things in dust. When they breathe dusty air, people with allergies may start to sneeze or have runny noses and itchy eyes. Once in a while, more serious breathing problems, such as asthma, are caused by dust.

How can we keep the air inside our homes and other buildings clean and safe? A little common sense goes a long way. We can be careful about using chemical cleaners, paints, glues and pesticides, and, instead, use products that don't pollute. We can reduce the amount of dust in the air by changing the filters in our home heating and cooling systems.

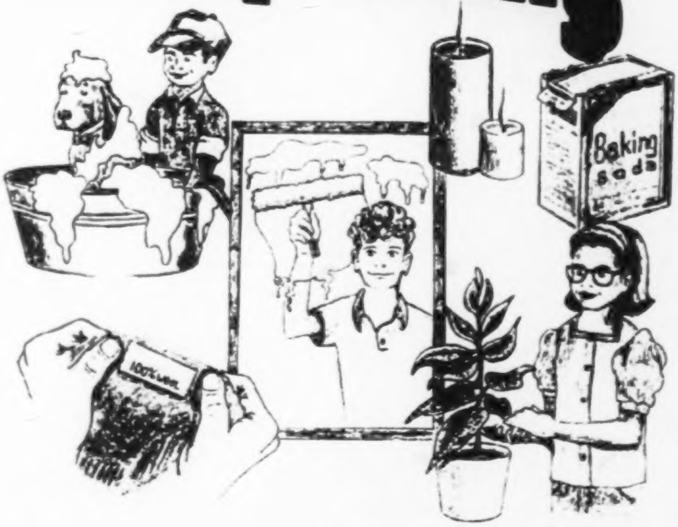
Can we "see" air? Try this in the sink, bathtub or a large bowl of water. Turn a clear plastic cup upside down and push it down into the water. What happens? Is there any water inside the cup? Now, turn the cup slightly on its side. You will see a big bubble rush toward the surface of the water. What do you think the bubble is made of?

oor Air

We can get rid of some sources of indoor air pollution completely. For example, smoking is no longer allowed in many public buildings, such as movie theaters, hospitals and schools.

Most importantly, we can remember how important it is to have clean air to breathe inside our homes, schools and offices. Each of us can do something to help keep our indoor air clean.

Tips for Healthy Living

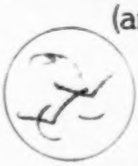


Try these and use fewer chemicals in your home!

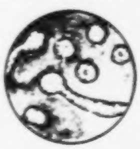
- Mix equal parts of powdered sugar and baking soda or borax. Set the mixture out in a small dish to control cockroaches.
- Wash your pet with lots of soapy water to drown fleas instead of using chemical sprays.
- Buy pure beeswax furniture polishes and candles.
- Use natural, untreated fabrics.
- Use baking soda as an air freshener for refrigerators, garbage cans and carpets.
- Coat plant leaves with soapy water to kill small insects.
- Mix 1 tablespoon of vinegar with 1 liter (quart) of water to make a cleaner for windows and floors.

Did you know what's in dust?

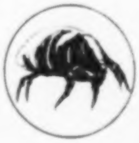
(answers to front cover)



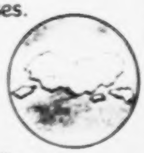
Tiny pieces of dead insects are in dust.



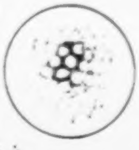
Spores are made by molds in damp places, like bathtubs.



Dust mites like to live in our pillows and mattresses.



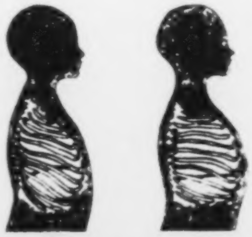
Amazing! This is a flake of dead skin.



Pollen grains are made by flowering or cone-bearing plants. Pollen sometimes gets inside too!

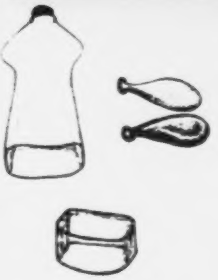
Breathtaking Fun

When we are not active, each of us breathes about ten times every minute. Surprisingly, our lungs have no muscles of their own. So, how can they do the work of breathing?



The work is done by muscles in the walls and bottom of the chest. When these muscles tighten, they make the space inside the chest larger. This lets air rush into the lungs. When the muscles relax, the space becomes smaller and air moves out of the lungs. Try to breathe in and out without moving your chest. Is it possible?

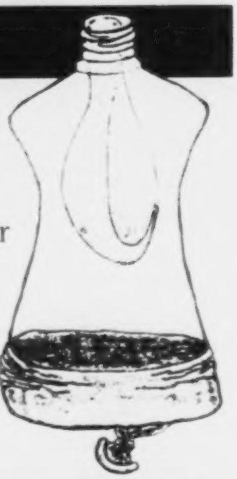
Try This!



You can make a model of the way your lungs work. You will need a medium-sized clear plastic bottle (a dishwashing soap bottle works well), scissors and 2 medium-sized balloons.

1. Have an adult help you cut off the bottom half of the bottle. The top part of the bottle should be about 6 (15 cm) inches tall.
2. Slide a balloon into the mouth of the bottle and roll the open end over the top edge of the bottle. This will be the "lung" in your model.
3. Cut off the top of the other balloon. Tie a knot in the bottom of the remaining piece. Slide the cut end around the bottom of the bottle.
4. Pull the bottom balloon carefully downward. What happens to the "lung" balloon? This is similar to what happens when you breathe in. Gently squeeze the sides of the bottle and push the bottom balloon into the space in the bottle. Now what happens?

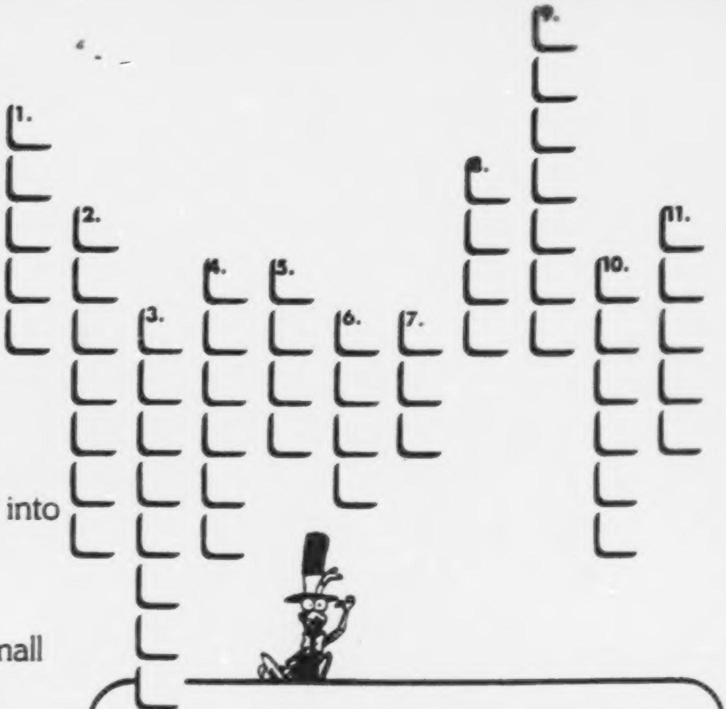
Coughing and sneezing help clean out your airways. Can you make your lung model cough or sneeze?



It's In The Air

Excuse me please,
I've got to sneeze.
I feel it coming on!
Is it the dust
In this old house
That makes it feel so strong?
Or maybe pollen from the plants
Released in spring and fall?
Or spores produced by all the mold
On our damp basement wall?
Or maybe pepper from the can
I spilled all over there!
Achoo, achoo, achoo, achoo-
There's something in the air!

Worldly Words



Here is a puzzle for you to solve along with a friend or family member. Use the clues below to fill in the vertical spaces and find the mystery word. Solutions to all of the clues can be found within the pages of this Explorations.

1. When some things burn, this goes into the air.
2. Tiny pockets of the lung.
3. Mineral that breaks up into very small fibers, once used often in building materials.
4. Molds spread by these.
5. It grows on damp things.
6. Name of Rosie's friend.
7. We breathe it.
8. Tiny bits of it float in the air.
9. Main air tubes inside the lung.
10. Many people are allergic to these tiny things produced in flowers.
11. You have two of these inside your chest.

Have you ever wondered why liquids like paints can cause pollution of the air?

Tiny amounts of these liquids become gases and enter the air. This is why you can smell them.

Try filling a clear container with colored water and setting it in a place where it will be undisturbed. Check the water level every day. What happens? What do you think this is called?

Not such a new issue.

In 400 B.C.. Hippocrates. a Greek scientist. noticed that lead caused serious health problems. Nowadays. this poison can be found in chips and dust from old paint.

"Cave men" must have had problems with smoke in their homes. Anthropologists have found soot on the ceilings of prehistoric cave dwellings.

We Can Make a Difference!

We are Mrs. Pineda's third grade class at Rucker Elementary School in Houston, Texas.

We read a story* about how Riff and Rosie helped their neighbor, Mr. Slaptail, clean up his house so that he could breathe better. We thought about how we could have less pollution in our houses or at school. We decided to have a Classroom Clean Air Day. Here are some things we did.

First, Mrs. Pineda opened the air conditioner so we could see the filter. It was packed with dust. All that dust came from the air that we breathe!

We opened the windows to let stale air out and fresh air in.

We put soapsuds on the leaves of our plants so we don't have to use poisonous insecticides.

We washed our desks and windows with vinegar and water. It doesn't pollute the air like some cleaners from the store do.

We cleaned our rugs with baking soda. It doesn't have any harmful chemicals.

Why don't you see what you can do to have cleaner air where you live or go to school?

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* Dresden, J., Tharp, B., and Moreno, N. 1995. *Mr. Slaptail's Secret.* My Health My World Adventure Stories for Children. Unit One: My World Indoors. Houston: Baylor College of Medicine.

Rosie and Riff talk to...

Dr. Cindy Jumper

Dr. Jumper, what do you do?

I'm a lung doctor. People who might have asthma or bronchitis, or lung damage from smoking, come to me. I work in a hospital and teach in a medical school. I also study how pollution affects people's lungs.

How did you decide to be a doctor?

When I was in school, I volunteered at a hospital. I got to work in the emergency room, and I really liked it. Later I became a nurse. I was one of only a few nurses in a small town, so I learned to do almost everything. But I wanted to do even more, so I decided to become a doctor.

Have you always been interested in science?

Yes, especially in how the body works. I liked chemistry a lot, and I've always thought being in a lab was fun!

What do you like most about your work?

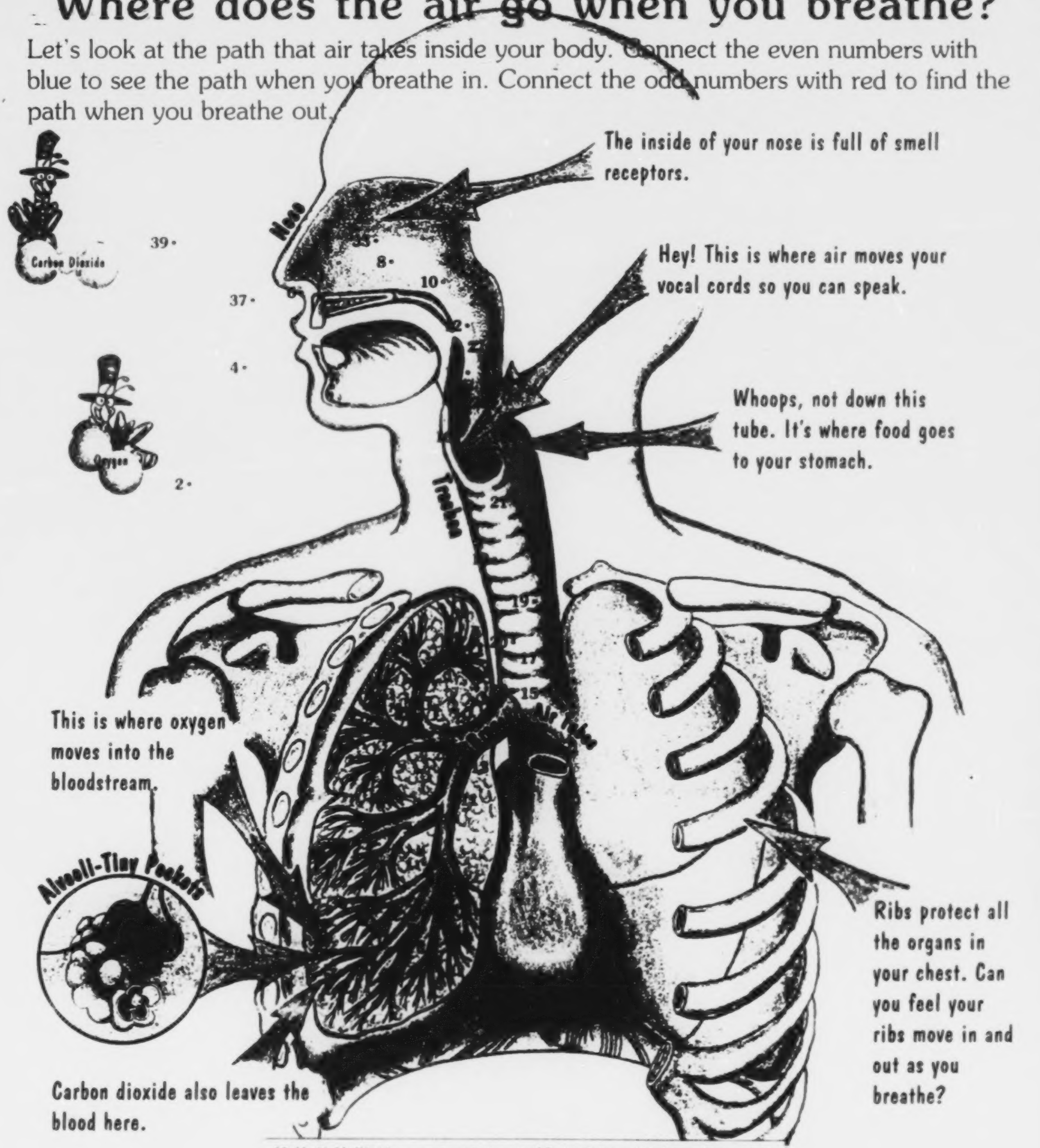
I like having the chance to do so many different things. Sometimes I can help people who are very ill, and that is exciting. I love to be able to keep learning and to teach others.

Is there anything else you would like to tell our readers?

I'd like to say, "Learn to be responsible for yourself. The things you do today can affect you, and maybe even your children, many years from now. If you decide to smoke, for example, think about what it might do to your body. You're still going to be in that same body in 50 years! Take care of it, starting now."

Where does the air go when you breathe?

Let's look at the path that air takes inside your body. Connect the even numbers with blue to see the path when you breathe in. Connect the odd numbers with red to find the path when you breathe out.



The inside of your nose is full of smell receptors.

Hey! This is where air moves your vocal cords so you can speak.

Whoops, not down this tube. It's where food goes to your stomach.

This is where oxygen moves into the bloodstream.

Ribs protect all the organs in your chest. Can you feel your ribs move in and out as you breathe?

Carbon dioxide also leaves the blood here.

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